

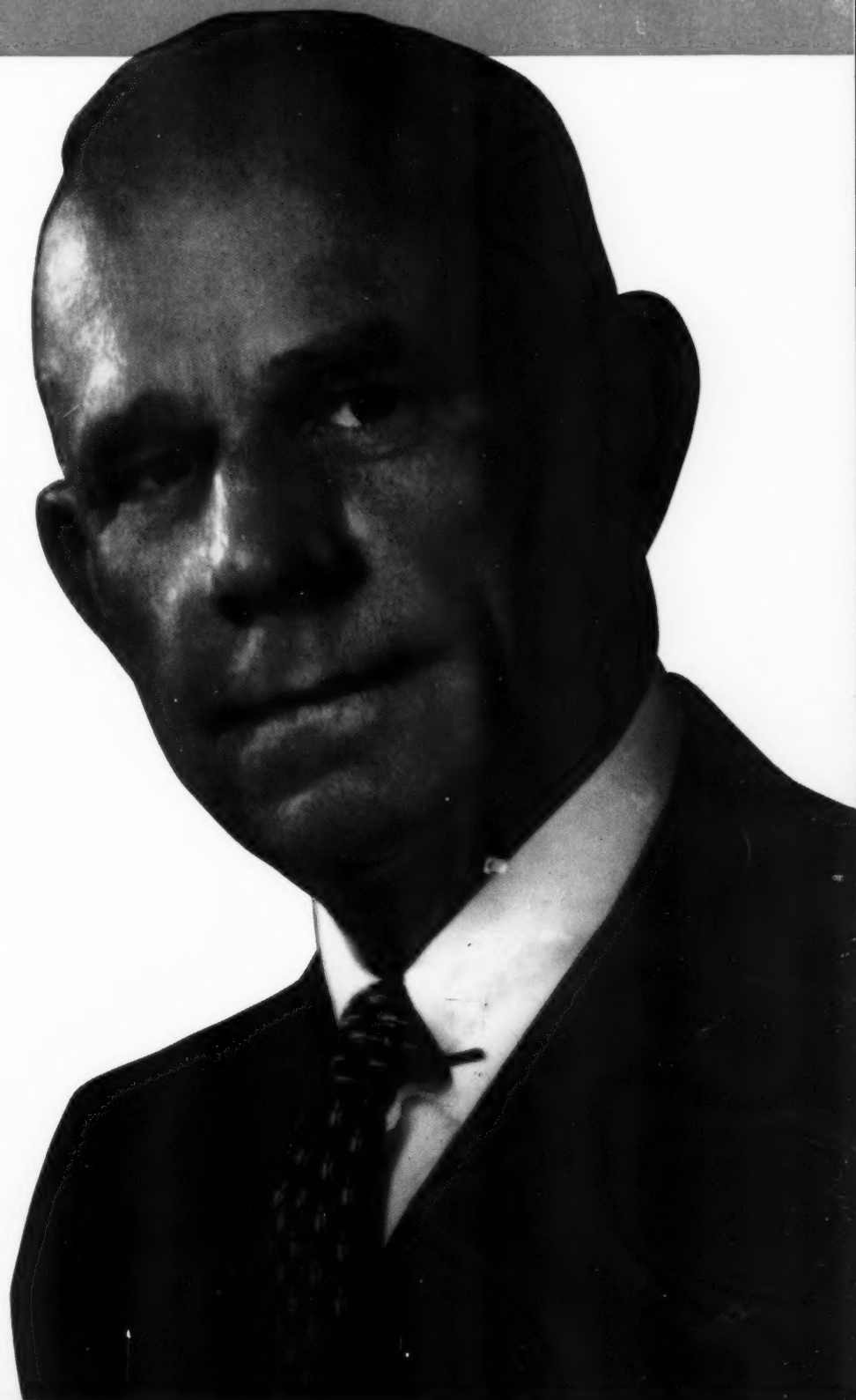
consulting engineer

January 1956

A Moral Approach

T. CARR FORREST, JR., of the Dallas firm of Forrest and Cotton, is a third generation Texan. His grandfather, Hardeman C. Forrest made the move from Mississippi, in 1853, to settle at what is now the town of Forrester, in Ellis County. There is still something in Carr Forrest's speech that is as close to the Old South as to the New South-

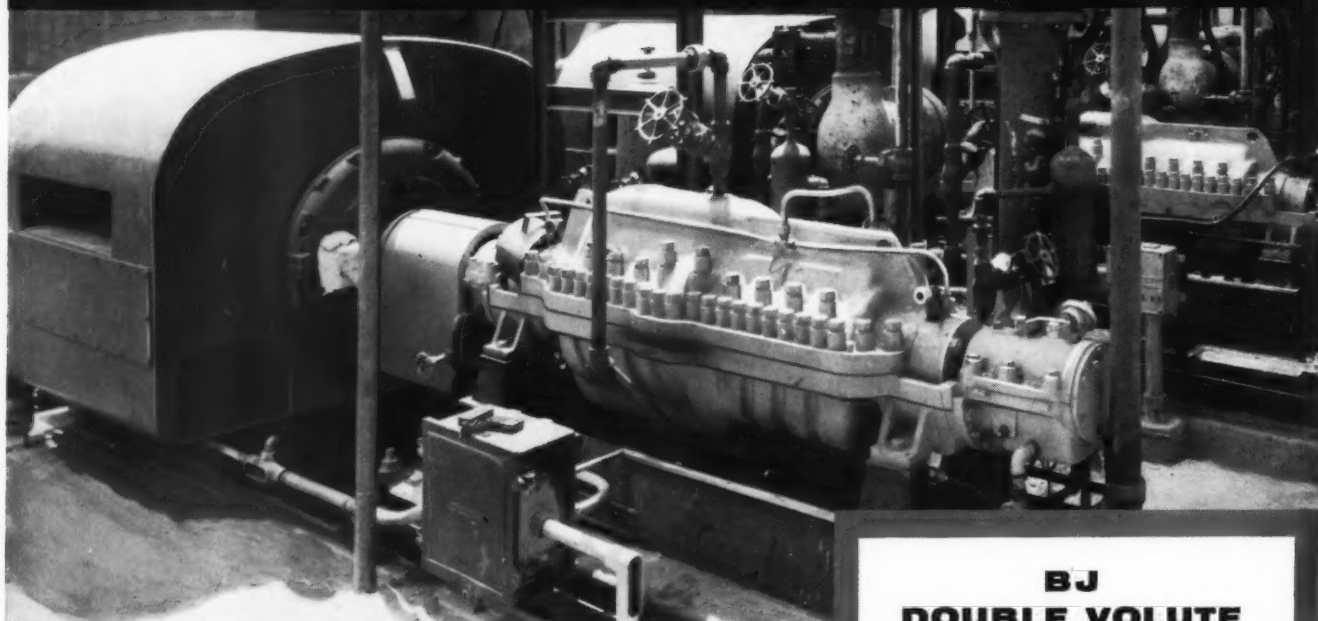
—Continued on page 6



The Consulting Engineer's Professional Magazine

NEW Byron Jackson DVMX SPLIT CASE BOILER FEED PUMP

...Engineered for Medium Size Power Plants



This new Byron Jackson DVMX split case pump gives the same trouble-free service that BJ barrel type Boiler Feed Pumps have been providing for the larger power plants in the United States for many years. This DVMX model is engineered primarily for medium-sized power plants and delivers capacities to 2200 gpm, heads to 1200 psig. and temperatures to 350° F.

Here's what you get in the new DVMX

- 1** Horizontally-split case, with both nozzles in the lower half of the pump case, permitting removal of the top half of the case and the complete rotating element without disturbing the piping.
- 2** Double volute design which assures radial balance of the pump at all capacities.
- 3** Impellers arranged in equally opposed groups, assuring hydraulic axial balance without resorting to the use of any auxiliary high pressure balancing devices.
- 4** Available with reliable BJ high pressure Mechanical Seal especially designed for boiler feed service.
- 5** Furnished with a spacer type coupling for easy removal of the mechanical seal.
- 6** The thrust and radial bearings including the self-contained oiling system are of the same reliable construction that has proven so successful over the years in the larger BJ barrel type Boiler Feed pumps. The oiling system is of ample size to supply the driver bearings if desired.

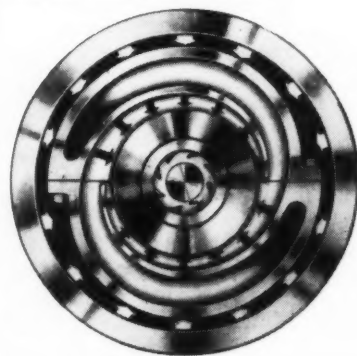
Byron Jackson

Division of Borg-Warner Corporation
P.O. 2017, Terminal Annex, Los Angeles 54, California

BJ

BJ DOUBLE VOLUTE

By the use of BJ Double Volute inner cases, the flow is divided into two identical fluid channels with outlets 180° apart. Equal opposing forces are created, resulting in radial balance without pressure-bending moment on the shaft.



BJ MAKES BOILER FEED HISTORY!

Byron Jackson is building the world's largest boiler feed pump. This 12,000 HP pump will deliver 6,330 gallons per minute at total head of 6,400 feet, or about 2700 pounds per square inch, at a speed of 3510 RPM.

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(See page 90)

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January 1956

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The Consulting Engineer's Professional Magazine

T. Carr Forrest

—Starts on front cover

west. But Carr is a Texan's Texan, and his stake in the Lone Star State is large.

Forrest attended both Trinity University and Texas A&M, but his formal education was cut short by World War I. His degree is an honorary PhD in Engineering, granted in 1954, by Southern Methodist University.

Planning Ahead

The Trinity River has been his personal problem. As a young man with the firm of Myers, Noyes & Forrest, his first Dallas project was for the city and county of Dallas Levee Improvement District. This covered an area subjected to the regular floods of the Trinity. He succeeded in controlling the area and opening up West Dallas to settlement and industrial development. From that day to this, he has been faced with Dallas' problem of either too much water in the Trinity or not enough in the city reservoirs. Currently, his firm is engaged by the city of Dallas for the development of a long range water supply, planning ahead to the year 2000, which, as Carr points out, is only a few years ahead, —and he is looking forward to it.

Perhaps he has in mind the design and supervision of construction of another great fair ground for an appropriately Texan celebration of the occasion. He would be the engineer to handle it, for he represented his firm as chief engineer for the first stage construction of the Texas Centennial in 1936—including the huge Cotton Bowl Stadium. He was also a consultant on the New York World's Fair.

Few engineers, in fact few Texans, have been so honored as Carr Forrest. He has been a president of the National Society of Professional Engineers; the Dallas Technical Club; the Dallas Post, Society of American Military Engineers; the Texas Section, American Society of Civil Engineers; and the Dallas Branch of the American Society of Civil Engineers. He is an honorary member of Tau Beta Pi, and recently has been elected to honorary membership in Chi Epsilon. He has long been an active member of the Dallas Chamber of Commerce, the Greater Dallas Planning Council, the State Planning Committee, and the Rotary Club of Dallas. Recently he has been appointed a member of the City of Dallas Master Plan Committee.

These professional society and civic activities are indicative of Forrest's interest in the human aspects of engineering. To him, engineering is not only a profession—it is a noble profession dedicated to the good of man.

"We must recognize," Carr Forrest says, "that the consulting engineer's responsibility to the public is weighty and profound. I say the consulting en-

gineer, because the consultant is, of all the engineers, the one with the most direct contact with the public, and he is personally responsible to the public and to himself for the work he does. The responsibility of the engineer in industry is great, but he is working for others, who have the final responsibility for the service or the product.

Public Acceptance

"At one time, when we lived in a less materialistic society, the engineer was little more than a tool—a piece of machinery. Now, the public is beginning to accept and rely upon the engineer, particularly the consulting engineer, as much more than a man with special technical abilities. The public sees the great responsibility of the engineer in our modern civilization and they respect him. They expect him to be a professional man, a man with a high code of ethics, both professional and personal.

"While we have a long way to go, we have made much progress in developing our professional code, but that is not enough. The engineer is in an awesome predicament. The welfare of most of the people of the world literally is dependent on his judgment, his technical ability, and his ethics. If the pure scientist, whose job is the discovery of fundamental truths of nature, is engaged in soul searching, surely the engineer who is called upon to develop and apply the basic discoveries must have an even greater sense of moral responsibility. Nuclear fission and fusion, for example, were discoveries of pure science, but applications of these discoveries are engineering projects, whether they are bombs or power plants. The pure scientist says, 'I have discovered this truth'; the engineer must say, 'I can put this truth to use, for good or for bad.'

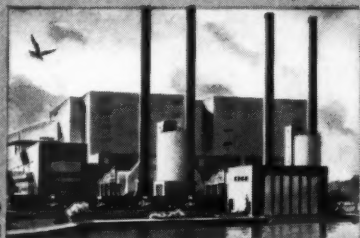
Moral Responsibility

"The engineer's moral responsibility goes further than the formidable ethical problems of atomic energy. Every day consulting engineers are faced with moral responsibilities of overwhelming magnitude. The design of a water supply system, for example, involves not only the current health of a city but its future growth or stagnation. Obviously, the design and construction of buildings, both public and private, is a moral responsibility. Even so relatively simple a project as an air conditioning system for a department store places a moral responsibility on the designer. And when we think of the decisions consulting engineers are making and will have to make in connection with projects proposed to better the living conditions and the industrial progress of other, less materially developed nations, we see such a load of responsibility that only the strongest are able to undertake it, and they with a sense of humility.

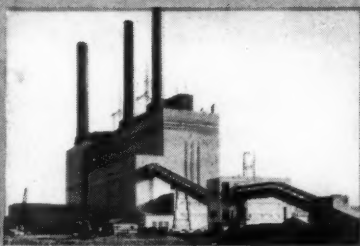
"There seems to be a moral—perhaps even a religious—renaissance in this country. It is particu-



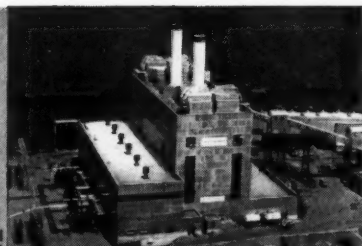
1 KANAWHA RIVER — 9113*
Appalachian Electric Power Co.
on the American Gas and Electric System
Two B&W Pressure-Fired Radiant Reheat
Boilers with Gas Recirculation
and Divided Furnace Construction.



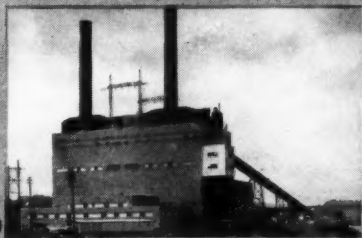
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Detroit Edison Co.
Four B&W Radiant Reheat Boilers
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and Divided Furnace Construction.



3 TANNERS CREEK — 9251
Indiana and Michigan Electric Co.
on the American Gas and Electric System
Three B&W Pressure-Fired Radiant Reheat
Boilers with Gas Recirculation
and Divided Furnace Construction.

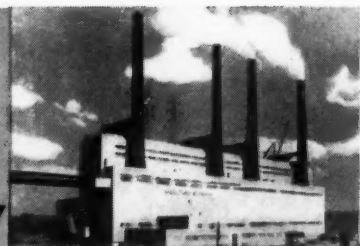


4 SHAWVILLE — 9310
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Two B&W Radiant Reheat Boilers
with Gas Recirculation
and Divided Furnace Construction.



5 MUSKINGUM RIVER — 9374
Ohio Power Co.
on the American Gas and Electric System
Two B&W Pressure-Fired Open-Pass
Reheat Boilers with Gas Recirculation

6 EASTLAKE — 9386
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10 JUSTIN R. WHITING — 9574
Consumers Power Co.
Three B&W Radiant Reheat Boilers.

*Btu/net kw-hr

LEADERS IN POWER PRODUCTION EFFICIENCY

Annual plant net heat rates of the ten most efficient central stations in the United States in 1954—as reported by the Federal Power Commission—are led by Kanawha's record 9113 Btu per net kw-hr. This means that Kanawha River Station requires only 9113 Btu of heat energy from fuel to produce one kilowatt-hour of electricity—far, far less than was required just a few years ago. This improvement is being carried out simultaneously with tremendous expansion of economical electric power.

These ten stations are strong vindication of the foresighted utilization of major engineering advances which are taking this nation so far and so fast along the road of power generation progress. The development of these advances has been possible only through the efforts of the electric companies and their primary suppliers working cooperatively to provide more electricity more efficiently.

In most of these leading stations, B&W Boilers with

advanced engineering features are contributing substantially toward achieving the remarkable efficiency levels reported. For example, at Kanawha the B&W vertically-fired Radiant Boiler units utilize pressure firing, Cyclone Steam Separators, divided furnace construction and other B&W engineering achievements.

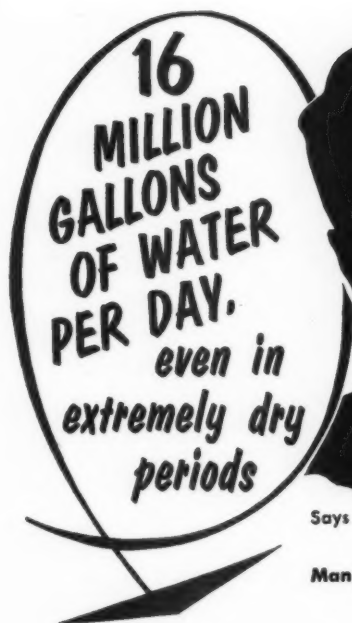
Just behind the ten leaders are more plants—many with B&W Units—producing abundant, economical power across the country.

Welcoming its responsibilities, B&W continues to combine almost a century of experience with the practical results of an extensive research and development program in the effort to achieve still higher levels of steam-electric generating efficiency.



BOILER
DIVISION

N-207



Says
Mr. R. E. Cannard
Manager, City of Manitowoc
Public Utilities

the **RANNEY METHOD** a "MUST" for the
CITY OF MANITOWOC, WISCONSIN



Collector "A" at the Power Plant,
City of Manitowoc

Mr. Cannard says, "We have found the RANNEY to be far more efficient than the conventional type wells. Our RANNEY collectors require less personnel, fewer pumps, cuts operating costs, and eliminates filter stations altogether. The RANNEY METHOD has solved our water problems and the collectors are just as good today as they were when they were installed ten years ago."

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larly clear in our leadership in government and in our professions. I think it is a conscious reawakening, and it is needed most in the engineering profession, for it is to the engineer that western civilization must look for material guidance. If this material guidance is not based upon a strong moral, ethical, and religious foundation, we cannot hope for much ahead. In fact, there may be no future, either good or bad, on this earth.

Engineering Students

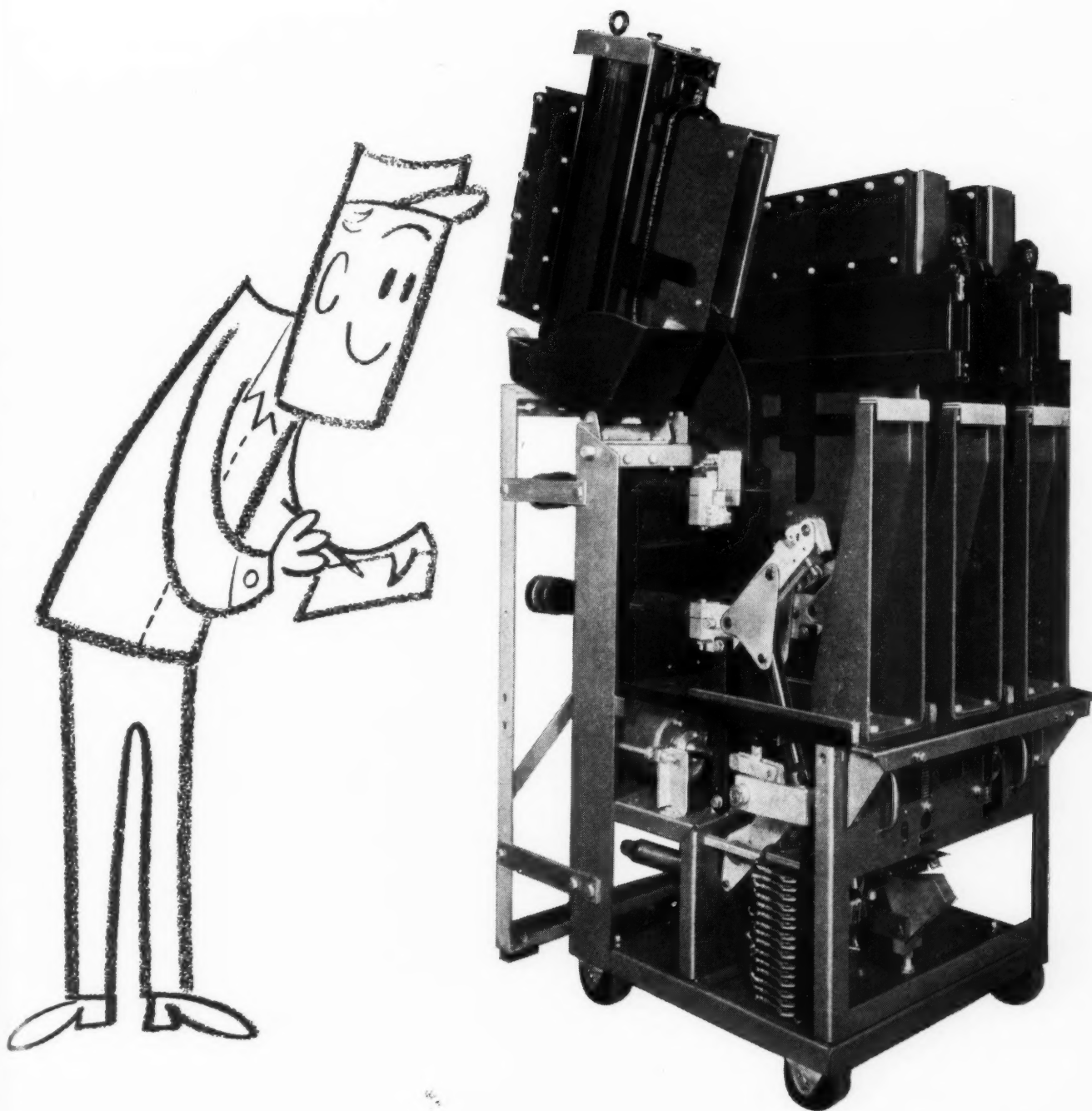
"We must not feel that this moral responsibility is simply for this generation. Even more important are the young students now studying engineering and those who will come after them. While every practicing engineer today should be conscious of being a master over the destiny of the people of the world, it is even more important that the engineering student be shown that engineering is not simply a business in which he can make a living but is a moral responsibility in which he needs Divine aid.

"Should we leave this job of inculcation entirely to the professor and instructors in our technical schools? Certainly, it is largely up to them, and in the hands of many of our teachers, we can be sure the young student will know the greatness of his role and the responsibility of his calling before he leaves school. But we, too, must help. We must give our time to meetings, lectures, and personal contacts with the engineering students and the young engineers to see that they know that they must be men of honor and integrity rather than technical automatons. They must be inspired morally as well as scientifically for future generations will depend on their decisions even more than ours. They must recognize that an engineering decision can be morally good or bad as well as technically right or wrong. They must understand that the technically wrong is always morally wrong, but even more important, the technically right may be morally wrong.

"This moral approach to engineering is important to me. As I pointed out, when I spoke at the observance of the Bicentennial of Columbia University, the need for spiritual understanding must be evident in engineering production, creative design, industrial progress, and leadership. We must realize that our expert knowledge must be used for the good of humanity instead of for selfish purposes. We and the engineers that follow us must not fail in our obligations to society and to our profession."

Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for \$1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER, 227 Wayne St., St. Joseph, Mich.



SEE VALUE HERE YOU'LL SEE NOWHERE ELSE

Operating engineers in the electrical industry often say you can see the higher quality in I-T-E switchgear even when you stand 'way back.

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But we want you to look closer—see even more. For example, in Metal-Clad Switchgear: the easy-to-service horizontal drawout design; the tilting arc chutes; the extra-heavy insulation. There's quality in every detail—quality that means dollars' more value for your switchgear investment and years' longer troublefree service.

Why not phone the I-T-E office nearest you. Or write for bulletin 7004 giving a complete description of 5, 7.5 and 15 kv switchgear. I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Phila. 30, Pa.



I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division



The Consultant and NSPE

Dear Sir:

Your thought provoking article on James M. Todd (Nov. Cover Personality) has been read with considerable interest. I should like to amplify briefly his well stated opinions.

In the NSPE the consultants numbered some 6500, or about 23 percent of about 28,000 readers as determined by a readership survey made January 15, 1952, by the *American Engineer*. A minority of

this size demonstrates both satisfaction and faith in the aims and activities of NSPE. It is reasonable to assume, therefore, that the problems of private practice are of primary interest to the Society. That such is the case is written into the history of that organization.

A case in point is the recent action of NSPE in authorizing functional groups. This follows the lead of several state SPE's, notably that of Ohio where functional groups were first organized in 1939. The NSPE instructed its Engineer-

ing Practices Committee to establish a functional group for consulting engineers in private practice. That is in process. Similar action was taken this fall by the MoSPE (Missouri Society of Professional Engineers) and on November 29th the consulting engineers (employers) in Kansas City requested without dissenting vote that the Western Chapter of MoSPE and the Eastern Chapter of the Kansas Engineering Society establish such groups.

Because of the manner of its organization and operation, the NSPE and its state and local societies can move at the pace desired by Mr. Todd, myself, and others. This has been demonstrated frequently as the record shows.

Lest it be said that most consultants are employers, not employees, let it be recognized that the professional needs of both groups are quite similar. The few essential differences of view-point do not, in the expressed judgment of many of my acquaintances, constitute a reason for forcing either group to take its organized efforts elsewhere.

Again my thanks to you and Mr. Todd for your clearly expressed opinions. I hope these thoughts of mine will help in furthering the professional advancement of all engineers in private practice.

A. C. Kirkwood, P. E.
A. C. Kirkwood & Associates
Kansas City, Mo.

Wagner vs Taft-Hartley

Sir:

In the discussion of the Taft-Hartley act (Oct. "Legal Aspect"), Mr. Nord seems not too enthusiastic over the effects of the law. Perhaps an illustration of the functioning of the earlier Wagner act might be of interest to your readers.

The manufacturing company of which I was chief engineer at the time was operating an open shop, faced the falling off of business, and in a mass meeting notified the employees that layoffs must start. These would be in accord with seniority or length of employment. Four recently employed men in the foundry, realizing that they would be among the first to be let out, went off and joined the union. In due course they were released and promptly brought charges before the Labor Board that they had been fired for joining a union.

Round 1. A combative examiner started hearings. Our supt. explained the procedure, with charts showing in detail how layoffs were deter-

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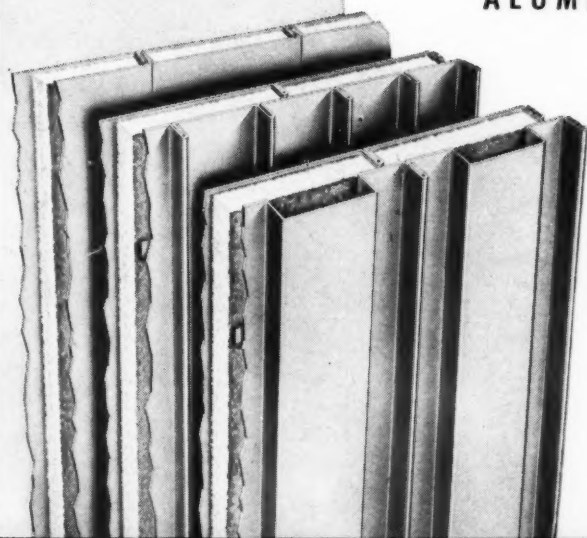
Particularly suited for conditions such as in the chemical and petroleum industries. Available in many types of stainless from Gary Type GW-75A ($\frac{3}{4}$ " x $\frac{1}{8}$ " main bar, $\frac{1}{4}$ " hexagonal cross bar) to Type SGW-225 ($2\frac{1}{4}$ " x $\frac{3}{16}$ " main bar, $\frac{5}{16}$ " hexagonal cross bar). Send today for full details.
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Over-all "U" Factor of Various Types is Equivalent to or Better than Conventional 16" Masonry Wall

In addition to their nationwide use in the construction of industrial plants, powerhouses, and commercial buildings of all types, insulated metal curtain walls of bright aluminum and stainless steel have recently been appearing in an increasing number of modern office buildings, schools and even monumental buildings. Stainless steel wall plates are used in the natural metal finish, but in many instances aluminum plates have been employed in grained, mottled or tinted finish for distinctive design effects in combination with other materials such as brick, ornamental stone, glass block or stained wood. With such a versatile product, the possibilities in design effects in exterior treatment are virtually unlimited. Why not have a Mahon engineer call and show you some interesting examples in which insulated metal walls have been employed to good advantage in combination with other materials to achieve unusually attractive, individualized exteriors. The office building below is one of many. Mahon Insulated Metal Walls are available in three exterior patterns . . . the "Fluted" and the "Ribbed" wall can be field constructed up to sixty feet in height without a horizontal joint—a feature of Mahon walls which, from an appearance standpoint, is extremely important in buildings where high expanses of unbroken wall surface are common. See Sweet's Files for complete information, or write for Mahon Catalog W-56.

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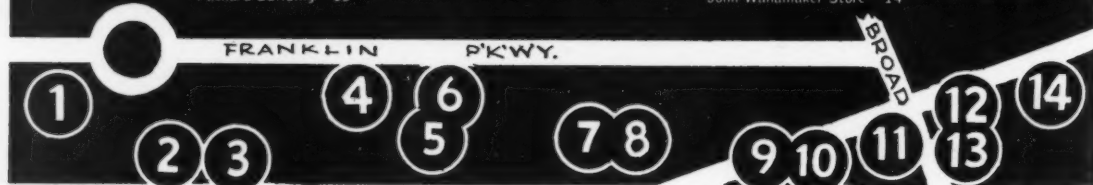
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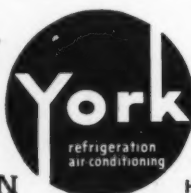
Franklin Institute—1	Bell Telephone Co. of Pa.—4	Insurance Co. of North America—7	1500 Walnut Street—10
Rittenhouse Claridge—2	Central-Penn National Bank—5	3 Penn Center Plaza—8	Philadelphia National Bank—11
Rittenhouse Savoy—3	Suburban Station Office Building—6	Pennsylvania Building—9	Western Saving Fund Building—12
	Packard Building—13		John Wanamaker Store—14



Now 30—three
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York brought the right kind of air conditioning to the Empire State Building, Cincinnati's Netherland-Plaza Hotel and to 27 of Miami Beach's largest, newest hotels. Denver's new Mile High Center, San Francisco's new Equitable Life Assurance Society Building and the striking new Colgate-Palmolive Building in New York have Yorkaire Systems, too. Famous York companions to 3 Penn Center Plaza are shown on the map above.

Also the Connecticut General Life Insurance Co., the Congress Hotel, Rockefeller Center, Inc., the Ford Motor Co. and Atlanta's Fulton National Bank!



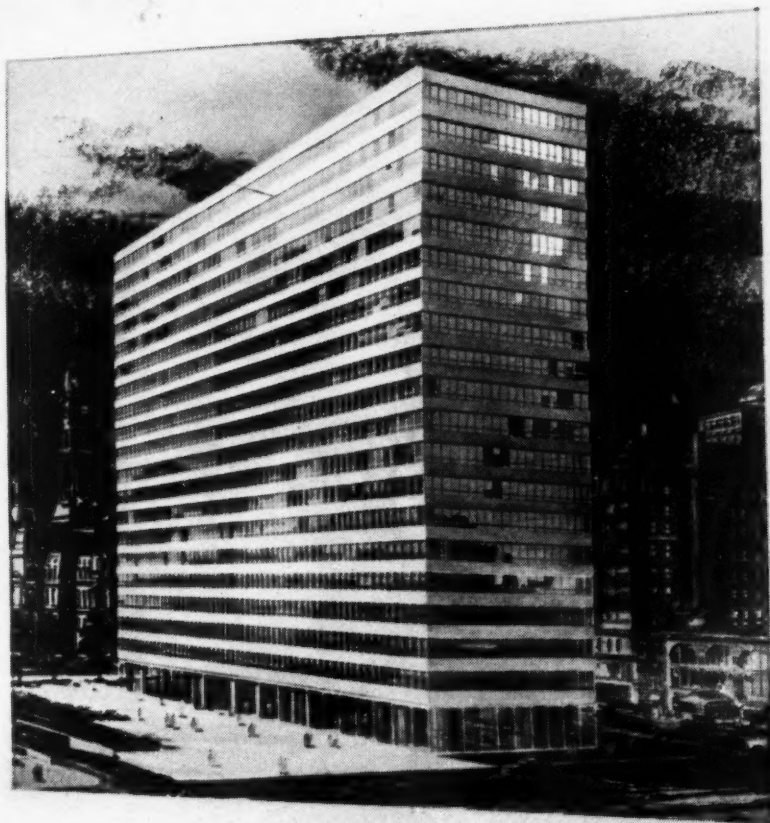
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Atlantic Refining Co., etc.

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all around the Center. Obviously, no one system—or even two or three—could air condition all these buildings best. That’s why York carefully selected and then precision-engineered each Yorkaire System to fit the air conditioning needs of the particular building in which it is installed.

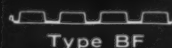
Your building can have the right kind of air conditioning, too. Call your York District Office (listed in the classified phone directory). Or write directly to York Corporation, York, Pennsylvania.

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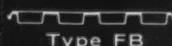
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JANUARY 1956

A Variety of
Milcor Cellufloor
Types
are available



Type BF



Type FB



Type BB



Type CF



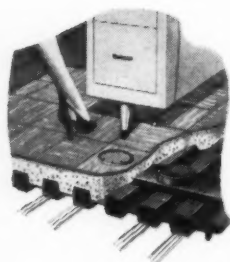
Type FC



Type BC



Type CC



Milcor Cellufloor cells, spaced on 6-inch centers, allow the installation of service outlets at any point on the floor.

Milcor Cellufloor meets any combination of circuit and design requirements

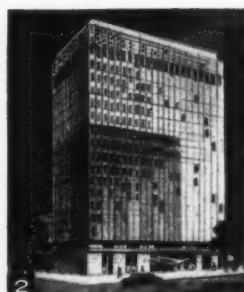
"Floor of the future" permits unlimited electrification

This steel sub-floor meets today's growing need for flexibility in providing communications and power. Milcor Cellufloor also combines strength with light weight, helps solve unusual load problems economically. It is engineered and factory-fabricated for consistent job performance.

No matter how complex the electrical system, Milcor Cellufloor has ample capacity to handle it. The raceways can be used also for specialized services — such as automation and data-processing circuits and cables for closed-circuit television hook-ups.

Catalog No. 270, available upon request, further develops the possibilities of Milcor Cellufloor.

MILCOR® Cellufloor



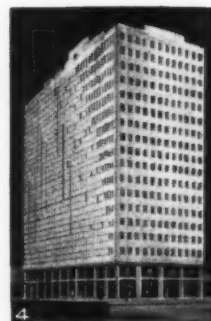
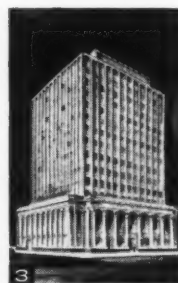
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2. In the Finance field
Commercial Credit Building, Baltimore,
Md. Architects: Harrison & Abramowitz,
N.Y.C. Engineers: Edwards & Hirth,
N.Y.C. General Contractor: Consolidated
Engineering Co., Baltimore, Md.

3. In the Banking field
Federal Reserve Bank Building,
Minneapolis, Minn. Architects: Larson
& McLaren, Minneapolis, Minn.
Consulting Engineers: Schuett-Meier Co.,
Minneapolis, Minn. General Contractor:
Naugle-Leck, Inc., Minneapolis, Minn.

4. In the Transportation field
Pennsylvania Transportation Center,
Philadelphia, Pa. Architect: Vincent G.
Kling, Philadelphia, Pa. Engineers:
McCormick & Taylor Associates,
Philadelphia, Pa. General Contractor:
McCloskey & Co., Philadelphia, Pa.



M-169

INLAND STEEL PRODUCTS COMPANY
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mined. The examiners report found the company guilty, ordered their re-instatement, and payment by the company of wages they had lost.

Round 2. The company appealed to the Labor Board, Washington. In due course, the examiner's report was upheld and the company was ordered to re-instate the four and pay them the two years wages they had by then lost.

Round 3. Appeal was made to the Courts. Here for the first time it was discovered that the examiner had deleted all the company evidence showing the reason for the layoffs, and showed only that the men had joined a union and had been fired. The Court of Appeals ruled that the Labor Board decision was completely unjust and cancelled it.

Round 4. The Labor Board appealed to the U. S. Supreme Court, which ruled that Congress had given no authority to the courts to pass on rulings of the Labor Board. The Labor Board notified the company to re-instate the four men and pay them the four year's wages they had by then lost—less any money they had earned in that period.

W. G. Hudson
Consulting Engineer
Chicago, Ill.

"Free Engineering"

Dear Sir:

Can you send me ten tear sheets of your Dec. staff article covering the CE meeting in St. Louis. That meeting may turn out to be as important to the CE as the American Legion meeting in St. Louis in 1918.

Comments on the New York Association of Consulting Engineers on page 62 are wonderful.

The "free engineering" angle has a new twist here in DC. The manufacturers now make the plans on the engineer's sheets, then the so called consultants are able to lower their fee to the architects and/or owners. The fact that the owners pay more for the air conditioning work is never brought up.

The answer is a strong CE association . . . it's the only solution in the tri-state area of Washington, D. C., Maryland, and Virginia due to the high number of registered men working "sun down."

We have 3510 registered engineers in DC. True some of the Registration Board members have resigned but it's a bit late.

Andre Merle
Andre Merle Associates
Washington, D. C.
CONSULTING ENGINEER

Commercial-Aire

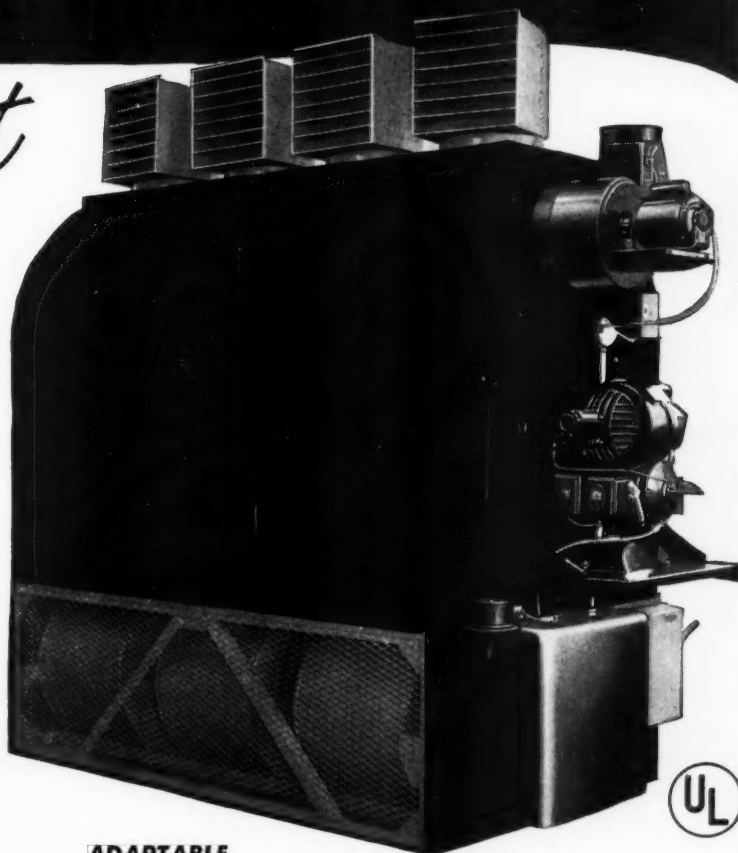
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EFFICIENT — Commercial-Aire direct-fired heaters offer a new high in efficiency. Recommended for heating of industrial, commercial and warehouse space. These heaters have a guaranteed combustion efficiency of 80%. Newly designed heat exchanger saves fuel. Oversize primary and secondary transfer surfaces stop heat losses. Separate induction draft blower purges combustion chamber. Delayed relay starts main burner only when heat exchanger is purged. Fan control starts main blower only when proper bonnet temperature is reached.

ECONOMICAL — Commercial-Aire direct-fired heaters burn fuel only when thermostats call for heat...no heat waste. Burners shut off when desired temperature is reached...no heat transmission loss. No fuel burned to maintain steam pressure or water temperature...no cold blast on start. High speed heat discharge maintains proper temperature at working level.



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TEN SIZES: From 300,000 to 2,000,000 B.T.U.'s at bonnet. A size for every job.

THREE FUELS: Commercial-Aire direct-fired furnaces burn heavy oil, light oil, gas and combinations of these fuels.

THREE POSITIONS: Each unit is of versatile construction and may be installed upright, horizontally suspended or inverted suspended. They are adaptable to direct space heating systems or duct distribution systems. Write for complete specifications and prices.



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VERTICAL STEEL TUBULAR HEATERS

Mammoth Vertical furnaces have been, for 30 years, widely used in churches, schools, factories, auditoriums and commercial buildings wherever duct-type heating is indicated. They deliver efficient, comfort heating with low fuel costs. Sizes from 208,000 to 2,379,000 B.T.U. output. Write for details.

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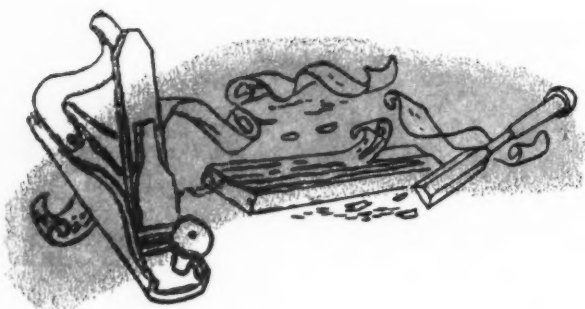
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☐ MAMMOTH VERTICAL TUBULAR STEEL FURNACES

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Firm Name _____

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SCRAPS & SHAVINGS

THE DEVELOPMENT of a concept of professionalism for engineers has been much discussed. We have heard so many say so much on the subject that it was a surprise last week to hear a new approach. At a small meeting of a chapter of the Michigan Society of Professional Engineers, we heard an Episcopal clergyman, H. Stewart Ross, explain professionalism in a new way.

The word "profession," he pointed out, comes from "profess," which was once a word belonging to the church rather than to lay language. Anyone taking an order of the church or entering a monastery "professed" his belief in the teaching and dogma of the church. This meaning of the word, the idea of professing a belief, is still the first listed in dictionaries.

Practically all of the learning of Western Civilization during the middle ages was confined to the monasteries and the other branches of the church. In fact, the doctor of medicine and the lawyer first were men of the church, for it was in the monasteries that they learned not only the specialties of their work but even the rudiments of reading, writing, and logic. Since all of the learned men came from the monasteries, they had all "professed" and were therefore "professionals." We see, then, that the real meaning of "professional" is tied in closely with the church and a feeling of dedication.

In the middle ages, these educated men of the church all had one characteristic that we today attribute largely to clergymen. They all felt "called" to their work. This is natural, for at that time there was still the feeling among all men that their work was literally their calling. A slave was called by God to be a slave; a mechanic was called to be a mechanic; and a doctor was called to be a doctor. Today, we still acknowledge that the clergyman frequently is called, that the medical doctor occasionally is called, and the lawyer perhaps rarely but sometimes is called.

So this idea of being called to do a particular type of work still exists, but it exists only in those fields that were once "professional" in that they were part of the church. Today, we seldom think of any man as being called or dedicated outside of those recognized and learned professions.

This makes it clear that another point at which engineering currently falls short of the learned professions is our failure to look upon engineering as a

true calling. How many engineers are engineers because they have answered a call in the way a clergyman answers a call when he goes into a seminary?

All too often the young man going to college selects engineering for some casual or even some mercenary reason. The very fact that such a small percentage of engineering graduates are actually doing engineering work is an indication that not many were called.

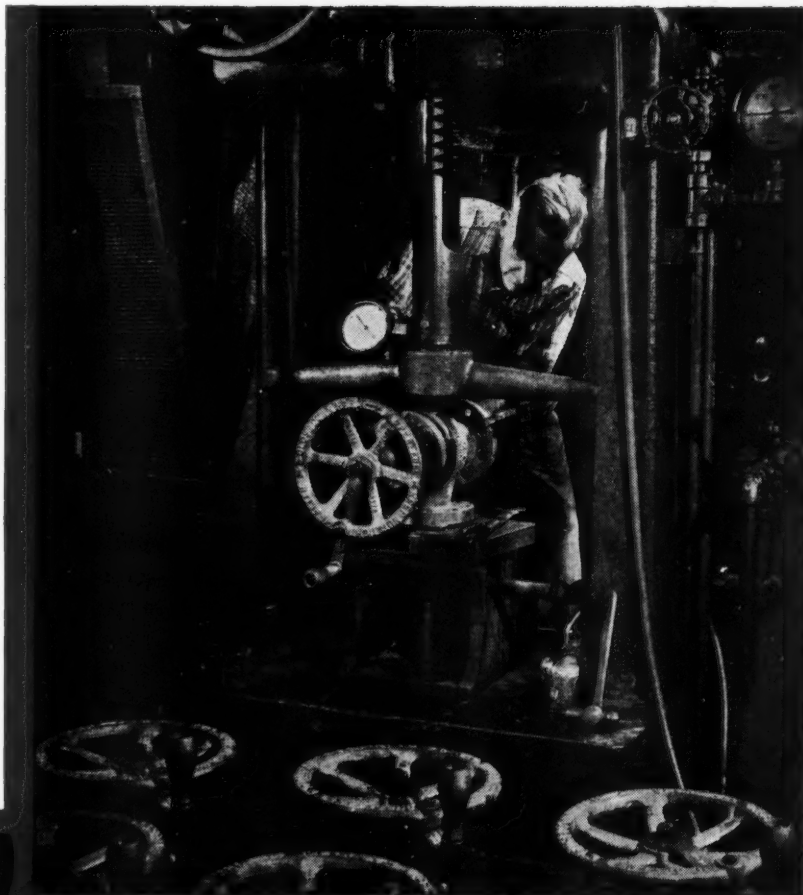
Yet, despite the fact that most young engineers are not engineers because of a "call," a "profession," or a dedication, there persists the attempt to drive more and more students into engineering whether they want to or not. The Russians, it is said, are turning out more engineers than we. Is that bad? Are engineers to be counted as head of cattle? Suppose the clergy were to take this attitude. They have a shortage, too. But if they were to fill the divinity schools with more students and assure a greater stream of graduates, would that mean a better clergy? Bigger, certainly! Better, no!

The industrial and material progress of this country, from both a civil and military point of view, does not depend so much on the number of engineers as on those who look upon engineering as their calling. A great bridge is not designed by ten engineers but by one dedicated engineer. A better turbine is not conceived by a hundred technicians but by the mind of a man who has been called.

It is true that we need more technically trained men. We need more draftsmen, more electricians, more mechanics, more electronics experts, more technicians of all sorts. But we do not need more engineers as much as we need better engineers, men who know that above all else, they want to do and must do original engineering work.

When we have more dedicated engineers, we will then have more men who "profess" engineering, and engineering will be that much closer to becoming a profession. There can be no profession based upon numbers nor can there be a profession where graduates of schools look upon their work as a step toward some other field such as sales or management.

Carr Forrest's ideas of professionalism, as published in this month's "Cover Personality" give a good example of how this true professionalism is applied. It presents the ideas of a man who looks upon engineering as a work to which he was called. ▲ ▲



THIS PRODUCTION "DOUBLE CHECK" SAFEGUARDS YOUR BOILER INVESTMENT!

■ Yes, here is one extra production step we will never bypass! It is your guarantee of a *dependable*, long-life blow-off valve.

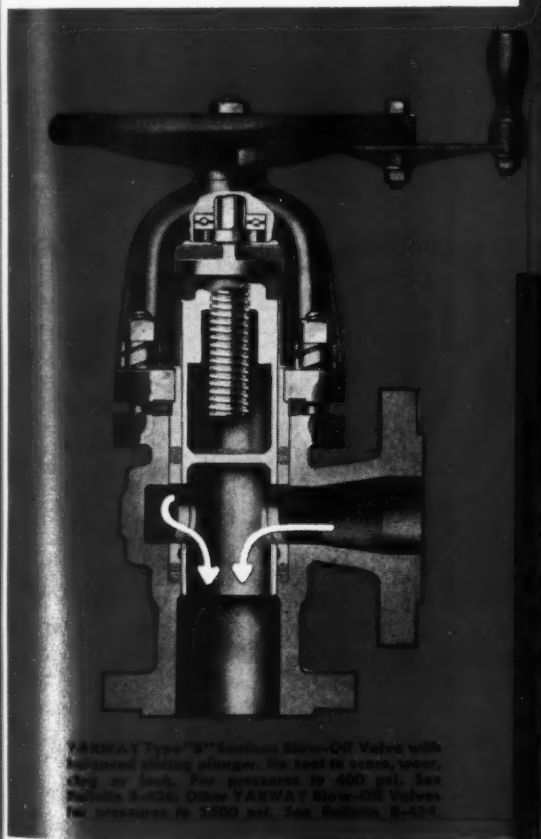
In this corner of the YARWAY Testing Department, *every Yarway Blow-Off Valve* is hydrostatically tested at $1\frac{1}{2}$ times its rated maximum working pressure—proved drop-tight for service far beyond normal expectancy.

Not only blow-off valves, but *all* YARWAY equipment undergoes rigorous tests before leaving the YARWAY plant. Why? For one reason—to assure longer and better service in *your* plant. Over 15,000 boiler plants are using YARWAY Blow-Off Valves—some for twenty-three years, or longer.

Whenever you are in need of boiler blow-off valves, be sure to *make Yarway your way*.

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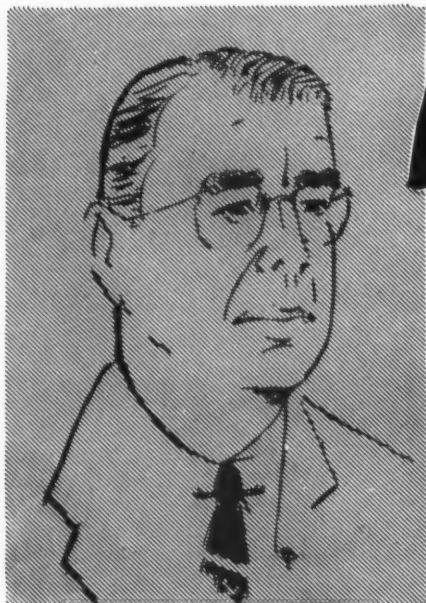
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E. F. Mac Donald
INDUSTRIAL ECONOMIST

ECONOMIC News Notes

▷ **MUNICIPAL BANKRUPTCY**—The city that fails to formulate a comprehensive, long-range plan for revamping, revitalizing, and reconstructing its urban pattern—and, further, fails to start carrying out such an urban renewal plan within the next few years will be courting municipal bankruptcy by 1965. This is the emphatic opinion expressed by Mr. A. M. Cole, head of HHFA. He adds, "The reason is elementary. The tax structure will not be able to support the demands imposed upon it."

▷ **ISLAND INDUSTRY**—A \$30-million shipyard will be constructed at Freeport, Bahamas Islands, according to plans announced by the D. K. Ludwig interests, one of the world's largest independent shipping empires. The license issued for the project permits construction of two basins large enough to take ships up to 80,000 deadweight tons. The largest shipway is expected to be 1200 x 200 ft. The same interests announced early last year plans for a \$50 million shipyard in the Dominican Republic.

▷ **SHORTAGE MAKER**—The 2240 mile natural gas pipeline to run from the Alberta oil fields to eastern Canada will require over 800,000 tons of steel, a record tonnage for a single pipeline. Under contract to supply pipe for a 600-mile section, U. S. Steel begins deliveries next month. And talking about pipelines—a Houston firm has requested permission to build two submarine oil and gas pipelines 25 miles offshore between Port Arthur and Biloxi to serve offshore wells.

▷ **WORK AHEAD**—An average outlay of \$144 million for the next 20 years would be necessary to modernize and maintain Kentucky's highways. This is the finding of an engineering report made last month by the Automotive Safety Foundation to Kentucky's Highway Department. And to the north, the West Virginia Chamber of Commerce has announced: "On the basis of new and realistic estimates of 'earmarked' income, and assurances that all available Federal Aid funds will for the first time in recent years be promptly matched, most West

Virginians will be surprised to learn that the vast sum of \$35,550,000 will be available for construction and reconstruction during the current fiscal year."

▷ **EXPERIENCED HAND**—The Florida Association of Architects has proposed that it meet with groups from other coastal states and areas to consider the best type of building for standing up to the hurricanes that have been battering the east coast, from the Carolinas north. The agenda would include building codes, design, and materials.

▷ **THEY'RE LEGAL**—The 113-mile, north-south Michigan Turnpike got off the mark last month when the Michigan Supreme Court ruled the 1953 toll-road act constitutional. A syndicate of investment bankers has been formed to bid on the bond issue that will be floated to finance the \$194-million project. The green light also went on in Illinois when that state's Supreme Court approved the sale by the State Toll Road Commission of \$415 million of bonds as a single issue to finance the three northern routes of the Illinois toll road system.

▷ **RECENT RELEASE**—General Services Administration has sent a booklet summarizing the revised Federal building standards to architect-engineering firms at work on plans for lease-purchase or government-financed structures. The changes in basic standards and specifications, made in accordance with approved commercial practices, were recommended by an advisory group of architects, engineers, contractors, and building managers. A revised building code has been released by the National Board of Fire Underwriters that provides authoritative answers to a wide range of questions in the construction design field.

▷ **THROUGH THE TRANSIT**—Outlays for new construction are running about 11 percent of total spending for goods and services of all kinds in the nation, a relatively high proportion. . . . Construction is close on the heels of the auto makers as the largest user of steel. . . . The Machinery and Allied Products Institute projects expenditures for business construction from \$9.8 billion last year to \$15.4 billion in 1965. . . . The five-state Gulf-South area of Texas, La., Miss., Ala., and northwest Florida has accounted for one-sixth of all the industrial construction in the U.S. in the past decade. . . . A 46-mile freeway system costing about \$350 million, to be started this year, has been approved by the Milwaukee County Board of Supervisors. . . . Since 1946, du Pont has spent an average of \$116 million a year on construction projects. . . . It is estimated that consumption of lumber, including imports, exports, and changes in distributors' stocks, amounted to 43 billion board feet last year, an all-time high.



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Most substantial and oldest design of grating made, permits perfect distribution of loads. Made on the truss principle, Borden Riveted Gratings are hydraulically power-forged for strength and durability. Particularly recommended for aluminum.

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ATOMS IN ACTION

THE PROBLEMS of providing adequate insurance coverage for risks involved in operation of nuclear reactors and materials are being attacked on two fronts. The Atomic Industrial Forum has announced the award of a \$50,000 contract to Columbia University for a one-year study of major risks and their insurance consequences. It will include appraisals of existing resources that insurers might apply to the liabilities involved, major resources used in comparable risk situations, and new measures that may seem appropriate to the atomic energy problem, with conclusions and recommendations. AEC has met with four industrial groups to seek "views and advice . . . on a number of policy matters affecting the regulatory program, including the problems of insurance." The urgent problem for AEC is whether or not to ask this session of Congress for legislation to make it possible for the Government to underwrite some of the risk. Several of the Power Demonstration Reactor Program proposals are contingent on availability of some sort of public liability insurance.

SARGENT & LUNDY, Chicago consulting engineers, have formed a 15-company association known as Atomic Power Engineering Group which "will devote itself to a detailed analysis of various reactor designs, technical characteristics, operating problems, and suitability for application to power systems." Other members of the group are utilities. Headquarters are in S & L's Chicago office.

THE MARITIME ADMINISTRATION has invited proposals for one, or both, of the following: design, manufacture, installation, and test of a 20,000 shaft horsepower nuclear reactor and associated machinery for installation and test operation by June 1959, in a 36,000 ton merchant tanker; and a study of the technical and economic feasibility of more advanced types of nuclear propulsion systems that might be developed through research. The Maritime Administration hopes that this approach will overcome the opposition met in Congress by the atoms-for-peace exhibit ship.

THE STATEMENT OF POLICY regarding atomic energy, issued by the board of directors of the National Coal Association concluded that "the Nation's best interests are not served by unwarranted optimism about the early availability of low-cost nuclear power." Although it recognized the "need to continue government sponsorship" of the nuclear development program, it asked for release of "actual cost information with respect to nuclear fuels."

COMBUSTION ENGINEERING, INC. will build a Nuclear Engineering and Development Center on a 530-acre site in Windsor, Conn., with facilities for complete design and development of nuclear power reactors, construction of reactor cores, and manufacture of related atomic fuel

elements. Stone & Webster Engineering Corp. will serve as architects and engineers. The large number of technical schools in the New England area influenced choice of the site. The company plans to inaugurate a broad program of cooperation with Eastern colleges, both at the graduate and under-graduate levels, to develop adequate engineering and scientific personnel for its growing participation in the nuclear field.

THE OHIO RIVER VALLEY Water Sanitation Commission has plans to secure measurements of radioactivity at selected points in the 981-mile length of the Ohio River and at the confluence of principal tributaries. This "radioactivity background" survey is a preparatory step to regular monitoring of the river to determine changes in water resulting from future disposal of radioactive wastes.

UNITED ENGINEERS & CONSTRUCTORS, INC. will construct the reactor test facilities for the Delray atomic power plant of Detroit Edison. UE&C has been working with Atomic Power Development Associates, sponsors of the project, for more than three years on studies of the use of atomic energy as a source of commercial power. The test facility, the first step toward a 100,000 kw power plant, will simulate operating conditions to determine optimum sizes and capacities of heat transfer equipment.

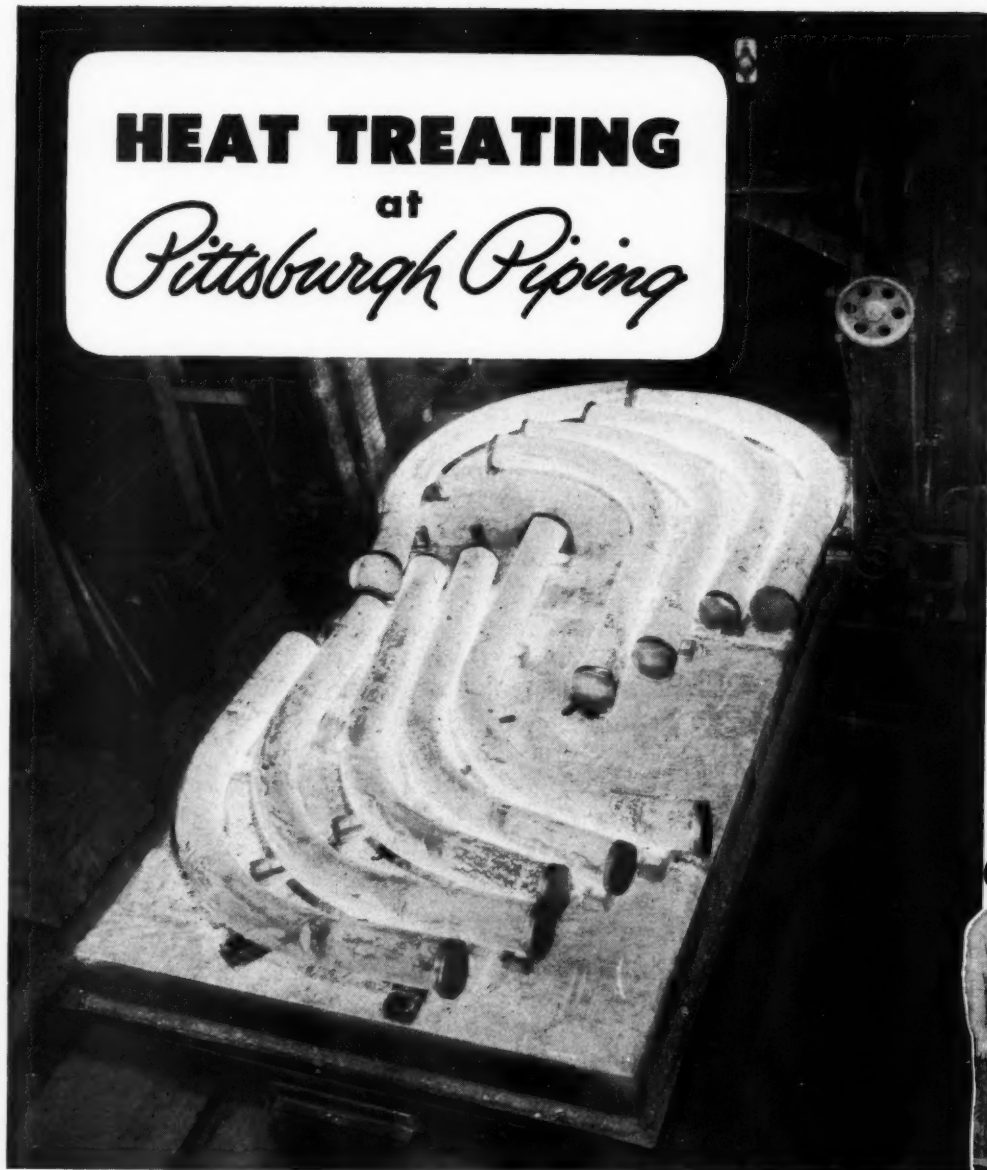
THE USE OF COOLANT waters from the Hanford reactors to heat several buildings is expected to save \$59,000 annually in fuel costs, according to General Electric. The initial outlay of \$614,000 for the system is about \$444,000 over the first cost of a conventional heating plant, but savings over a few years should defray this cost.

A SERIES of 26 films on the peaceful uses of atomic energy, "The Magic of the Atom," is available for rent or sale from the Handel Film Corp., 6926 Melrose Ave., Hollywood 38, Calif. The films were produced with the help of AEC and the University of California. Not to be outdone, Cinerama will produce a full length feature film about atomic energy uses tentatively entitled "The Eighth Day." Actual filming will start this month with the first showing scheduled for late 1956.

INITIAL FINANCING arrangements for the pressurized water reactor proposed by the 12-company Yankee Atomic Electric Co. have been approved by the Securities & Exchange Commission. AEC is still considering a revised proposal submitted by Yankee when their first proposal was turned down. SEC also exempted the two members of the group planning to hold more than 10 percent of the voting securities (New England Power Co. and Connecticut Light & Power Co.) from provisions of the Public Utility Holding Company Act of 1935.

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the Legal Aspect

MELVIN NORD

Consultant in Legal and Technical Problems

Registered Professional Engineer

Patent Attorney



Air and Water Pollution: Injunctions

AS POINTED OUT in the previous column in this series, there are three remedies available at common law in the case of a nuisance, i.e. self-help, damages, and an injunction. Our problem now is to determine the circumstances under which an injunction will be granted by the courts, assuming the existence of a nuisance.

Equity Courts

The first difference between an action for damages and an action for an injunction is that the former is "at law," while the latter is "in equity." Equity courts differ from law courts in that they administer a more flexible form of justice, where the strict application of law would produce an unjust result or would fail to provide an adequate remedy. Equitable relief is discretionary with the court and is not available as a matter of right. That is to say, the mere fact that the plaintiff can show that his rights have been violated is not sufficient to show that he is entitled to relief in equity. Equitable relief is basically a privilege granted to those needing it, rather than a right possessed by all. Therefore, it is difficult to predict whether or not equitable relief (an injunction) will be granted.

In addition to proving the existence of the nuisance, the plaintiff must also show that irreparable injuries will be caused him, in order to obtain an injunction. If the nuisance consists of a single act that is not likely to be repeated, no injunction will be given, since damages (obtainable at law) would be adequate. However, a single act that is likely to be repeated, or a continuing nuisance, is eligible for injunctive relief.

If the injury is to the plaintiff's land, or to his use or enjoyment of land, the damages are automatically presumed to be irreparable, since land is regarded at law and in equity as unique, i.e. not replaceable by money. This doctrine of the uniqueness of land is based primarily on history, going back to feudal days when land was the only really important type

of property. It also makes sense today, since by "land" we actually mean a unique geographical portion of the earth. Therefore a continuing or repetitious private nuisance of the type that interferes with land, or an interest in land, is eligible for injunctive relief.

Even where a nuisance has been proven, and it has been shown that the damages would be irreparable, an injunction may be refused on equitable grounds. Thus, there may be what is generally called an "equitable defense," which would not be a defense to an action at law for damages but is a defense to an action in equity.

Equitable Defenses

Among the equitable defenses is the clean hands doctrine which states that no one can get relief in equity unless he comes into court with clean hands. This means that he must not be guilty himself of misconduct or unfair dealings in connection with the particular situation involved. Another equitable defense is the doctrine of laches, which states that no one can get relief in equity if he has delayed bringing the suit for an unnecessarily long time, thereby causing the defendant to rely to his detriment on the reasonable assumption that the plaintiff would not bring suit. Mere delay alone does not disqualify the plaintiff; the delay must have caused an injury to the defendant.

Assuming all these hurdles have been by-passed, there remains one further stumbling block when an injunction is sought in some states. This is a doctrine known by various names, — "relative hardship," "balance of convenience," "balancing the equities," or "comparative injury." According to this doctrine, an injunction will not be granted when the harm the injunction would do to the defendant greatly outweighs the harm that the nuisance causes the plaintiff.

This doctrine would seem to be a straightforward application of common sense and justice and is in the

EVER CONSIDER HIGH TEMPERATURE WATER FOR YOUR HEATING AND PROCESSING NEEDS?

Both steam and high temperature water have their place, and your particular requirements will determine which is best for you. In either case, the complete C-E line includes a type and size of boiler exactly suited to your needs. Where high temperature (HT) water seems indicated, it affords such important advantages as:

The higher available heat in HT water — many times that of steam at the same pressure.

Closer control of temperature.

Heat loss is lower with the HT water closed system . . . unused heat returns to the boiler . . . no condensate return lines.

No elaborate feedwater treatment required. Make-up requirements are exceptionally low.

Steam traps not required — trap problems and attendant expense are eliminated.

No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

The planning of any new heating and/or processing system should include the consideration of a high temperature water system. There are many hundreds of HT water installations operating abroad and a rapidly growing number in the U.S.A. It may be *just right* for your requirements.

**C-E LaMont Controlled Circulation
Hot Water Boiler**

Advantages of the C-E "HT" Water Boiler

Once it is established that HT water is right for your needs, your next concern is selection of proper equipment. The C-E high pressure, high temperature water boiler has inherent advantages that make it the best possible choice. It is especially designed for HT water applications utilizing as it does the principle of forced, controlled circulation which is extended throughout the entire system. This accounts for numerous points of superiority in the C-E LaMont Controlled Circulation Hot Water Boiler. Among these are:

1. Complete control over HT water movement in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
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4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. More efficient heating surface can be arranged because of controlled, positive circulation.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Other features such as: gastight, welded steel casing . . . fewer headers, all of which are accessible.

The C-E LaMont Controlled Circulation Hot Water Boiler is available in sizes ranging from 10 to 200-million Btu per hour, or more, with pressures up to 500 psi and temperatures to 475 F — higher if required.

If you are in the market for a heating or process system — or expect to be — by all means investigate high temperature water and the C-E "HT" Water Boiler. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our new catalog HT-172.

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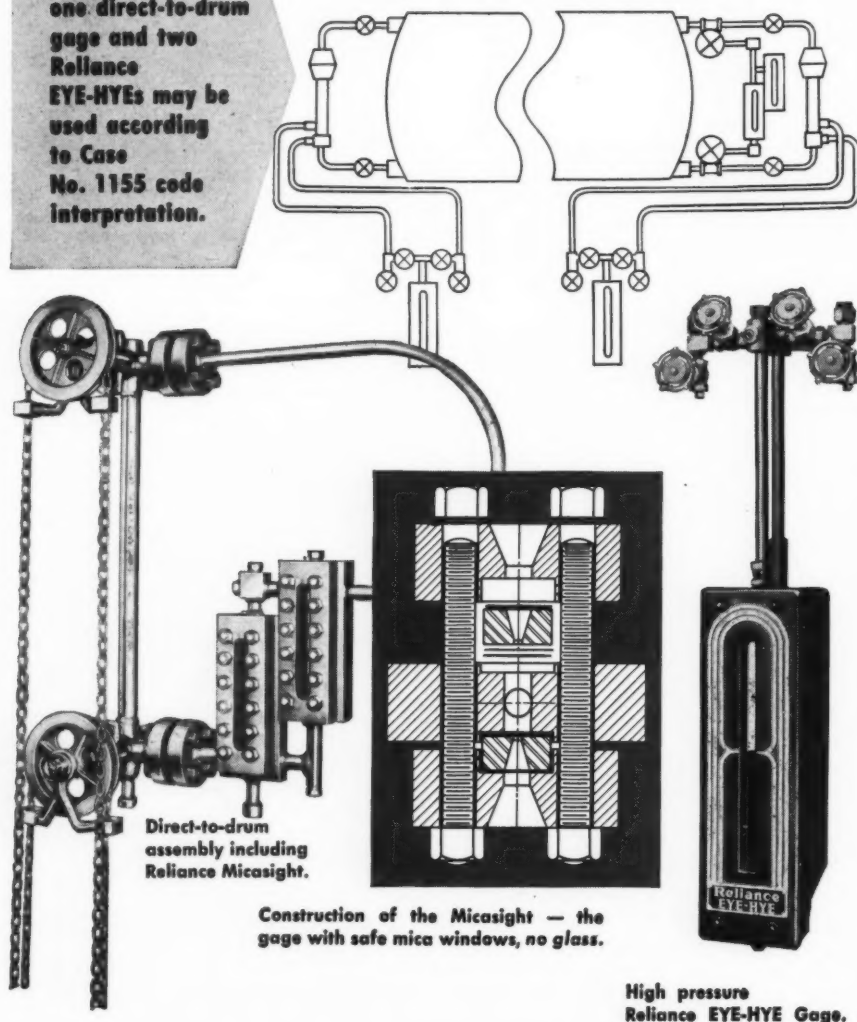
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This diagram illustrates how one direct-to-drum gage and two Reliance EYE-HYEs may be used according to Case No. 1155 code interpretation.

Permissible hook-up for high pressure boilers (900 lbs. and over) gives you double remote gage facility



It pays you to be familiar with provisions of the reply given in Case 1155 (boiler code) leading to more efficient gage reading on boilers operating at 900 psi and over. The two required manometric gages can be the remote reading EYE-HYE that supplies convenient eye-height supervision at your panel board. A gage glass must still be available at the drum, but it may be shut off when both remote gages are operating.

For the gage at the boiler, the safest known is the Mic sight. Made up of tough sheets of mica clamped in a short, wide-bar non-breathing body, it gives you extra safety and long window life.

Direct-to-drum high pressure gages are made to fit individual needs, with expansion type tube assembly as illustrated above. Write for complete explanation of Case 1155.

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best tradition of equity. This is especially evident when one considers that even if the plaintiff is denied an injunction, he will still be able to obtain damages.

The courts that refuse to apply the comparative injury doctrine take the position that the defendant should not be protected merely because he has gone to great expense to injure the plaintiff by committing a nuisance and, further, that the right to use and enjoy one's land fully should not be taken away by a private person who happens to be rich.

There is, however, wide acceptance of the view that comparative injuries should be considered in deciding whether or not a temporary injunction should be granted, pending outcome of litigation.

Typical Cases

We now consider a sequence of cases that illustrates some of the legal principles of nuisance as applied to air pollution. The Ducktown Sulphur, Copper and Iron Co., and the Tennessee Copper Co. were the defendants. In the first case in this litigation each company was sued by private individuals for an injunction to restrain further operation of the plants. The complaint was that the defendant companies' plants released large volumes of smoke and fumes, which injured trees and crops and made the complainants' homes less comfortable and their farm lands less profitable. Each of the plaintiff's lands was assessed at about \$80.

The court found as a fact that the total tax aggregate of Polk County, where the plants were located, was \$2,585,000 for the year 1903, of which \$1,279,000 was assessed the defendants. Only 200 people lived in the district prior to the operation of these companies, but this had since increased to 12,000 people, almost wholly dependent on these plants. It was also found that the Tennessee Copper Co. had an average monthly payroll of \$400,000 (13,000 men). Further, the companies

SOLVAY PROCESS DIVISION

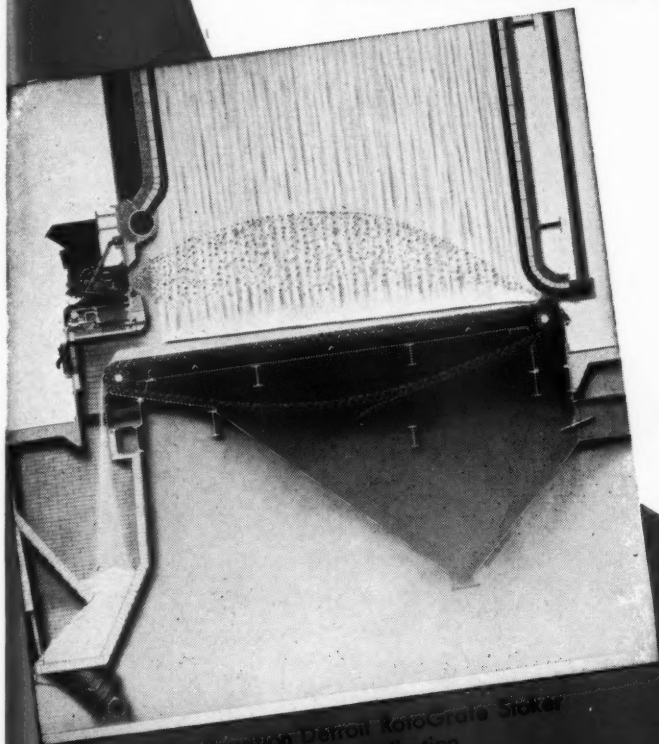
Allied Chemical & Dye Corporation

USES DETROIT ROTOGRATE STOKERS

*at Moundsville
to Burn West Virginia Coal*

Detroit RotoGrate is a modern spreader stoker with grates that move slowly forward, discharging ash at the front. It will burn any type of Bituminous coal or lignite and many types of combustible refuse with high efficiency. Handles rapidly fluctuating loads. Produces more capacity per square foot of grate area. Precise control of fuel feed with grate speed and air supply provides smokeless operation.

There is a size and type of Detroit Stoker for every industrial need.



Side elevation Detroit RotoGrate Stoker shows uniform fuel distribution and continuous cleaning feature.

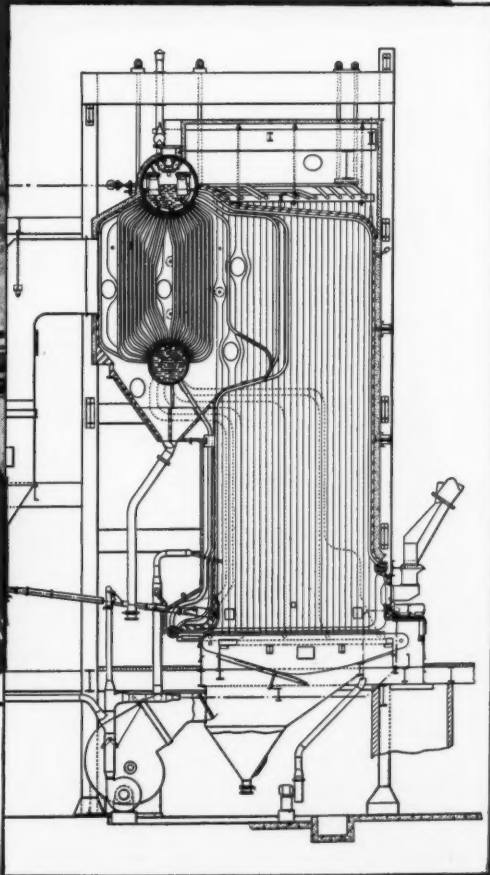


Moundsville, West Virginia, (Marshall County) Plant, Solvay Process Division, Allied Chemical & Dye Corporation.

Ask for latest Bulletin.

DETROIT STOKER COMPANY
GENERAL MOTORS BLDG. — DETROIT 2, MICH.
DISTRICT OFFICES IN PRINCIPAL CITIES • MONROE AT MONROE, MICH.

Detroit RotoGrate Stokers with Babcock and Wilcox two drum Stirling boilers in Moundsville Plant

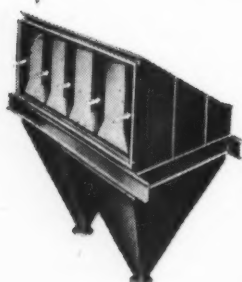




Your plant and equipment suffers . . . your community goodwill fades away. These problems can be solved. Prat-Daniel Collectors are designed for the control of industrial dusts and flyash. Multiple small diameter tubes provide powerful centrifugal forces, resulting in sustained high collection efficiency . . . even with ultra-fine dusts.

Whether the problem is industrial dust or flyash, you are assured of satisfaction with P-D Collector Systems, engineered to meet your specific needs.

Write for Reprint No. 102 titled, "What Type Collector?"



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PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

consumed approximately 3000 tons of coke, 2800 tons of coal, and 1000 cords of wood per month and about 80 percent of these were purchased in Polk County.

Injunction Denied

The court held that there was a nuisance for which damages could be recovered, but refused to grant the injunction because of laches on the part of one of the plaintiffs. He had waited too long (ten years) before making any complaint. Concerning the other plaintiffs, the courts said: "In order to protect by injunction several small tracts of land, aggregating in value less than \$1000, we are asked to destroy other property worth nearly \$2 million, and wreck two great mining and manufacturing enterprises that are engaged in work of very great importance, not only to their owners, but to the state and the whole country as well, to depopulate a large town, and deprive thousands of working people of their homes and livelihood and scatter them broadcast. The result would be practically a confiscation of the property of the defendants for the benefit of the complainants."

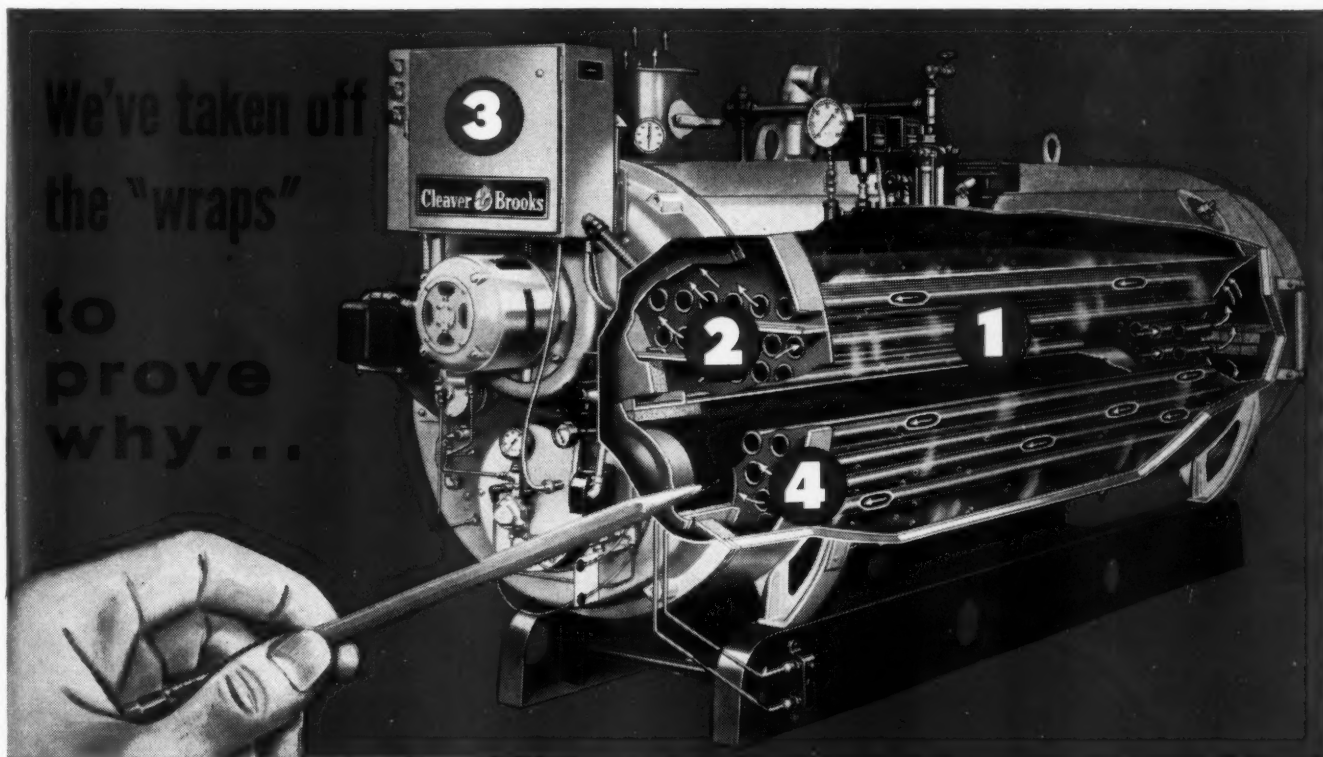
Obviously the Tennessee court followed the "comparative injury" doctrine. Later, both companies were sued for an injunction by the State of Georgia that based its claim on public nuisance; the case reached the United States Supreme Court four times. The State of Georgia alleged that noxious gases from defendants' works caused a wholesale destruction of forests, orchards and crops, and other injuries were done and threatened in five counties of the State. Both companies were located in East Tennessee near the Georgia boundary line.

In the first of these cases (1906), it was held that an injunction would be available, but that it would be postponed to allow time for the defendants to complete the efforts they were making to stop the fumes.

In 1914, the case was in the

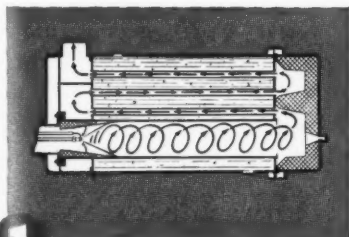
CONSULTING ENGINEER

We've taken off
the "wraps"
to
prove
why...

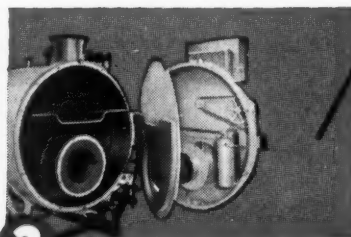


CB is America's most modern boiler

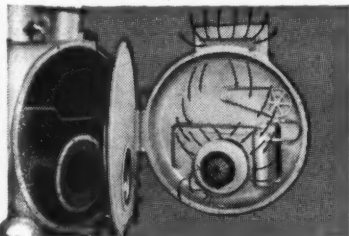
unmatched in
performance
quiet operation
low-maintenance



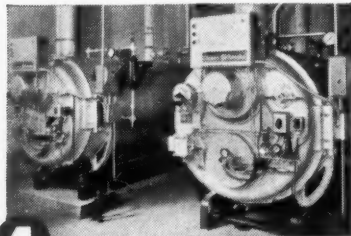
1 Four-pass design with forced draft — Proved the most efficient combination to transmit greatest percentage of heat to boiler water. Blower provides cool, clean air in required density and volume for efficient fuel combustion — lowers fuel costs.



2 Hinged doors front and rear — Expose tubes for quick inspection or cleaning. Operating equipment and refractory stays intact. Cuts routine maintenance from hours to minutes. Doors are gasketed with preformed asbestos to be seal-tight.



3 Caseless fan keeps operation "hospital quiet" — Air is drawn into a large plenum chamber which confines and deadens air noises. Even at peak loads, CB is well within requirements for low sound levels where this is a factor.



4 Automatic controls are centralized for convenience, efficiency and safety — Air is metered with oil (or gas) in proper ratios to economize on fuel. Electronic flame failure control is standard equipment.

CB boiler's remarkable performance in hundreds of applications has proved an "eye-opener" wherever installed. Take a minute's time and see why.

Combined into one boiler package are all the features *proved necessary* to: (1) save fuel dollars, (2) simplify maintenance, (3) assure silent performance, (4) maintain safe, automatic operation.

Talk to your nearby Cleaver-Brooks boiler representative — he can assist you in selecting the proper unit from a complete line of sizes, steam or hot water, 15 to 250 psi. Or, write direct for literature. Cleaver-Brooks Company, Dept. A, 320 E. Keefe Ave., Milwaukee 12, Wis., U.S.A. Cable Address: CEEBEEWEST — all codes.

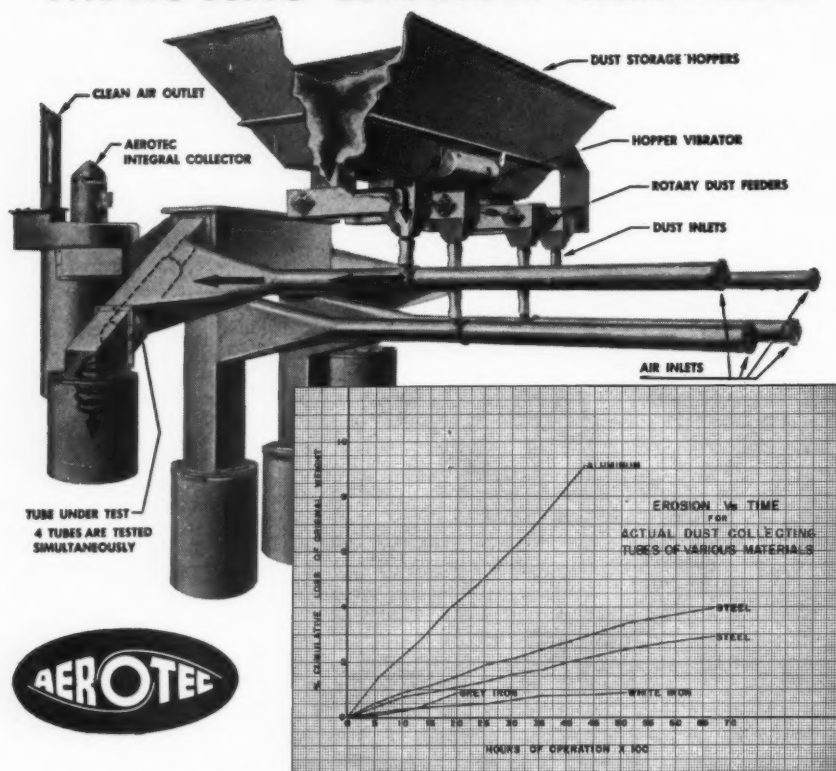


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...PROVING EROSION RESISTANCE



Wear machine developed in our laboratory to test resistance of various metal tubes. Above chart shows loss of weight in tubes of aluminum, steel, grey iron and white iron.

years of research by AEROTEC now assure longer tube life for mechanical dust collectors

Dust collector tubes of aluminum, because of the ductility of the metal, were at one time thought to be more erosion resistant than steel. However, *accelerated tests now prove conclusively that of all the basic metals tested, white cast iron tubes assure greatest resistance to abrasion.*

In setting up the test procedure, unusually severe abrasive conditions were simulated—many times more severe than ever encountered in field installations. The most troublesome dust erosion-wise was selected for the test. After 6700 hours of continuous operation, tube wear for various metals produced the curves shown on this page. Note the outstanding performance of the white iron tube. Although in many cases aluminum tubes are proving entirely satisfactory, white iron is now recommended for the majority of new installations.

In development for over three years, the new Aerotec 5" white iron tube will assure longer life and continuing high efficiency in your dust collection equipment. Why not call or write today for complete information? Address The Thermix Corporation, Project Engineers for Aerotec.

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Supreme Court for a final decree. The facts as found by the court may be summarized as follows: the ores used by these copper companies contained about 20 percent sulfur and in smelting, great quantities of SO_2 are formed that in the air become sulfurous acid, which is destructive of plant life. Both companies installed purifying devices, and the Tennessee Co. and the State of Georgia entered into a stipulation whereby the company undertook to supply an annual fund to compensate those injured by the fumes, to conduct its plant subject to inspection in specified ways, and between April 10 and October 1 not to operate more green ore furnaces than necessary to permit operation of its sulphuric acid plant at full capacity.

The Ducktown Co. and the State were unable to agree and in 1914 the latter moved for a decree according a perpetual injunction. The Ducktown Co. had spent large sums of money—more than \$600,000 since the first hearing in 1906—in constructing purifying works approximately halving the percentage of sulfur content of the ores escaping into the air as sulfur dioxide. The court granted a temporary injunction restraining Ducktown from operating its plant unless: (1) it kept daily records showing fully and in detail the course and result of the operations; (2) a competent inspector, appointed by the court, had access to books and records of the company. (3) not over 45 percent of the sulfur in the ore was permitted to escape, not above 20 tons per day between April 10 and October 1, nor above 45 tons per day at any other time.

Conflict Between Decisions

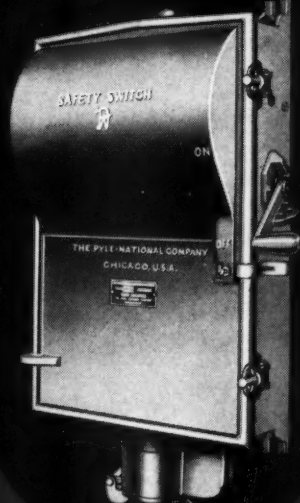
The difference between the United States Supreme Court decisions and the Tennessee Court decision on the same nuisance illustrates the conflict between courts of different jurisdiction as to whether or not the comparative injury doctrine will be applied.

Heavy Duty Safety Switch, and Circuit Breaker

RAIN-TIGHT!

DUST-TIGHT!

RAIN-TIGHT SAFETY SWITCHES with receptacle, fusible or fuseless, ratings up to 100 amps, 600 volts . . . without receptacle, up to 200 amps, 600 volts. (NEMA TYPES V, IV and III)



DUST-TIGHT AND RAIN-TIGHT CIRCUIT BREAKERS with receptacle, ratings up to 100 amps, 600 volts . . . without receptacle, up to 225 amps, 600 volts. Dust-tight types for hazardous locations, Class I, group E, F, and G. (NEMA TYPES II, V, IV and III)

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... designed for Safe, Reliable Operation and Protection of Portable and Stationary Electrical Equipment, indoors and outdoors, in Railroad Shops, Yards and Terminals.

MUCH LONGER SERVICE LIFE AND LOWER MAINTENANCE COSTS insured by heavy, rust-resisting cast metal construction and rain-tight gasket seals.

COMPLETE SAFETY FOR THE OPERATOR is provided by safety circuit grounding and the interlocking of door and plug receptacle with a quick make and break switch mechanism.

Consult your Pylet Catalog, Bulletin 1240 for complete listings.



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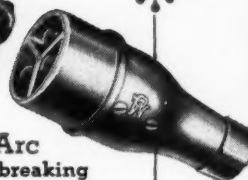
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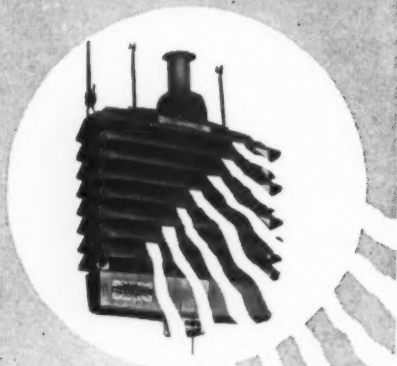
QuelArc circuit breaking type plug.



PYLE QuelArc plugs, used with this equipment, are well known industrially, for their unique partitioned construction. Long insulating surfaces from pole to pole, and from poles to ground provide for exceptionally safe handling and long service life.

PLUGS AND RECEPTACLES • FLOODLIGHTS • TURBO-GENERATORS • GYRALITES • CONDUIT FITTINGS • MULTI-VENT AIR DISTRIBUTION

Bring the Sun Indoors!



**Your Plant can now have
EFFICIENT, HEALTHFUL HEAT
silent and draft-free
with
PANELBLOC
INFRA-RED UNIT HEATERS**

- Comfortably heats workers and machines within radiation area.
- Heat not wasted on air which would normally rise to ceiling.
- No fan, motor or electrical connection needed.
- Never shut down due to power failure.
- Heat delivery cannot be diverted by drafts from open doors.
- No moving parts . . . less maintenance.
- May be used with any commercial type gas fuel.

Remember how comfortable it feels to stand in the warm sun on a cold day? That's how Panelblocs work. Gentle, comfortable heat rays warm everything they touch. You have all the advantages of conventional heaters . . . none of the disadvantages.

Panelbloc uses no fan. This means no drafts (heating is accomplished by guided radiation). With no electrical connections, Panelbloc costs less to install—will continue to operate during a power failure . . . and it heats, not air, but personnel and equipment . . . anything solid.

Panelbloc may be installed in practically any type structure for general heating; for spot heating in an otherwise unheated building; for heating a single room . . . In fact, almost any heating requirement can be solved with Panelbloc. Available in two models: 62,500 btu and 125,000 btu input.

For warm air heating check the Prat-Daniel THERMOBLOC Heater . . . used the world over.

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REPORT FROM ABROAD

FRITZ D. HIRSCHFELD
European Editor

UNTIL VERY recently, there has been little contact between U.S. and European consulting engineers. Although both groups share many common professional and technical interests, there is as yet no point of contact that allows these groups to become acquainted and exchange information regarding their activities.

This is unfortunate. European consulting engineers have made substantial progress in resolving ticklish professional problems involving ethical practices, advertising, fee schedules, and unity of organization—all of which are important to consulting engineers in the U.S. The European experiences in this area can serve as guide and example for our own professional development.

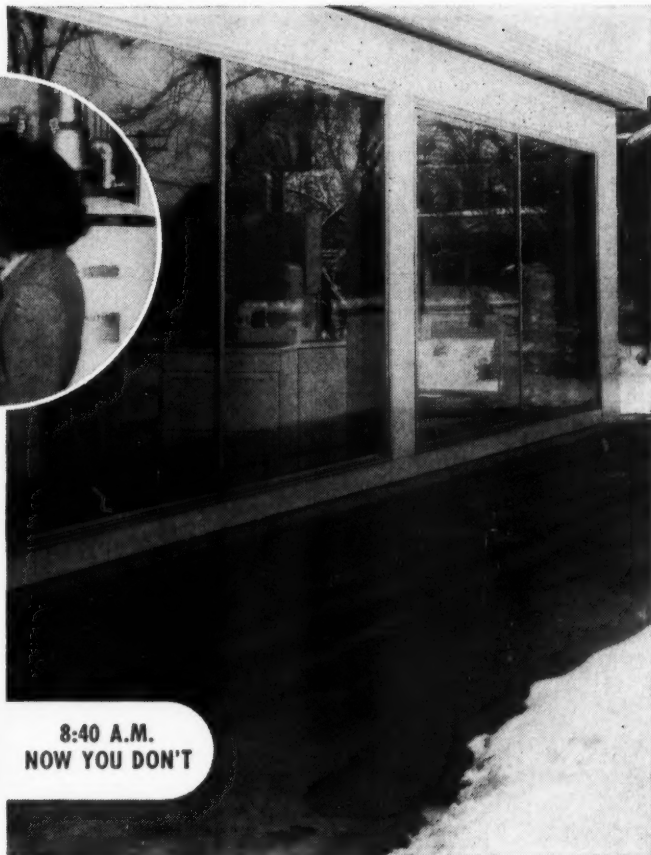
Why have not steps been taken to bridge this gap? A large part of the explanation can be blamed on misinformation. European consultants are under the impression that American consulting engineers are not truly independent professional engineers but are somehow tied in with manufacturers' or contractors' interests. They have some justification for this opinion. Invariably, representatives of the large manufacturers or contractors operating in Europe leave the impression among Europeans that they are consulting engineers. And since it is very difficult, if not impossible, for the local people to corroborate the statements of these over-exuberant representatives, they often accept them at face value and use this same manufacturers' or contractors' yardstick to measure all consulting engineers.

On the other hand, Americans generally take it for granted that all engineering in Europe is done by the engineering departments of a few large and well-known European firms. Because, broadly speaking, the Americans only have contact with these large establishments they tend to ignore

the existence of some 2,000 professional consulting offices in ten European countries—these offices ranging in size from one-man operations to consultants employing over 300 engineers—and responsible for designing everything from power stations to drydocks. Furthermore, because European consultants do not advertise (they consider it unethical) it becomes that much more difficult for strangers to readily locate or identify European consulting firms.

In spite of these handicaps, curiosity and common interests are now stimulating a little more aggressiveness in bringing American and European consultants into closer contact. The AICE (American Institute of Consulting Engineers) has taken steps to discuss with FIDIC (International Federation of Consulting Engineers) means for the AICE to become a member of FIDIC. CONSULTING ENGINEER magazine (see page 55) is sponsoring a trip to Europe in the spring during which American consultants will have an opportunity to meet European engineers on a personal basis and lay the groundwork for future cooperation in matters of mutual interest. The OEEC (Organization for European Economic Cooperation) in Paris will send over this year a group of European consulting engineers who will visit with American consultants during a six or eight week tour in the U.S. Privately, individual American consultants have been invited to talk before groups of European engineers when they are in Europe.

European consultants have indicated a strong interest in working with American engineering firms. Americans have acquired a great deal of specialized knowledge (atomic energy, steam power plants, cathodic protection, oil refineries) that Europeans lack. Americans have a strong position in influencing financial support for a project. Some American consult-



8-year old WROUGHT IRON PIPE SNOW MELTING SYSTEM still performing WINTER MAGIC

Giving winter snows the "hot foot" is an old story for The Protane Corporation, Erie, Pa.

Their snow melting system dates back to 1947 when a network of wrought iron pipe grids, 12-feet wide and 51-feet long, was installed under the sidewalk in front of their LP-Gas service building.

How efficiently the system has worked since installation is shown in the above photographs which were taken after a four-inch snowfall. The picture at the left illustrates the melting in process. Here, a hot water and antifreeze solution, flowing through the embedded pipes, is clearing the snow. Note that there is no run-off water. The snow melts, and quickly evaporates. In the picture at the right, taken 40 minutes later, all the snow has disappeared and the sidewalk is virtually free of moisture.

Starting the system is a simple matter. A push of a single button (see insert

photo above) activates a high velocity pump and hot water is circulated through the wrought iron pipe system.

The Protane Corporation is gratified with the efficiency of this automatic "winter magic." But the real record, as far as they're concerned, is the trouble-free operation. "Eight years without maintenance, and the system is still going strong," is their report.

There are good reasons for the dependable, trouble-free service of wrought iron pipe in snow melting systems. You'll find complete information on why wrought iron lasts long, at lower cost per year, in our bulletin, *Byers Wrought Iron Pipe for Snow Melting Systems*. Write for a copy.

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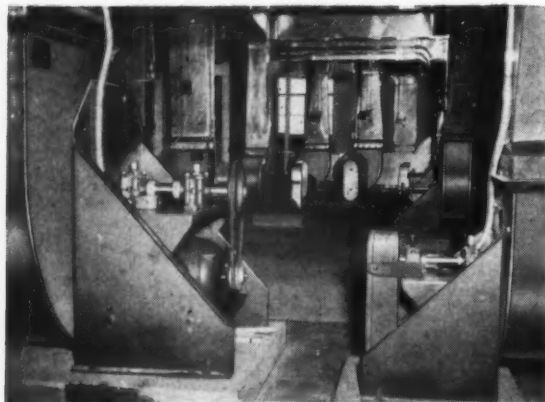


BEST FOR SNOW MELTING BECAUSE...

It resists corrosion longer . . . it provides high heat transmission . . . it expands and contracts at virtually the same rate as concrete . . . it forms and welds easily on the job . . . it bends true, without spring-back . . . it assures sound welds and sharp, full depth threads . . . it withstands installation damage. No doubt about it . . . the advantages of wrought iron pipe for snow melting systems start with installation and continue in service.

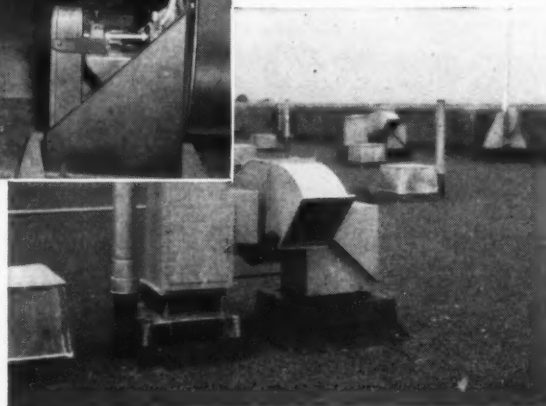
BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON
WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY STEEL PRODUCTS



INDOORS — VENTILATION OF ZONES OR WHOLE BUILDINGS
Compact "Buffalo" Belted Vent Sets are easily installed singly or in groups (at left) for varying volume requirements, or for different zones — and new fans can be easily added as ventilation requirements increase.

OUTDOORS—VENTILATION THAT DOESN'T USE FLOOR SPACE
Furnished with all-weather drive, husky Belted Vent Sets are ideal for roof or other outdoor installations. Range of capacities is 500 cfm to 20,000 cfm in this line of extremely quiet, efficient ventilating fans.



FAN FLEXIBILITY..

TO SIMPLIFY YOUR JOB PLANNING

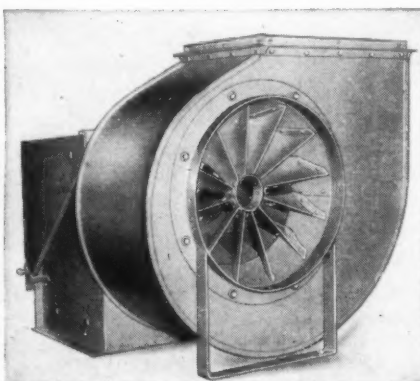
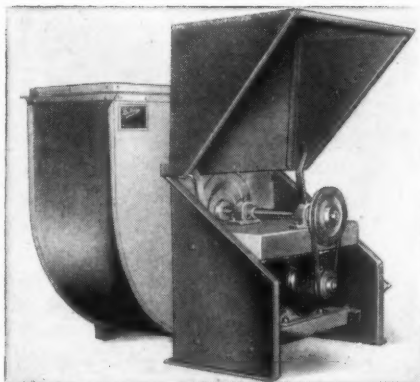
"Buffalo"

BELTED VENT SETS

Whether you're planning a large or small air moving job, these fans will fit right into your plans. Installation can be indoors or outdoors, and their light weight and compact size simplifies the job. You can get large capacity at small-fan cost with multiple-fan installations—for complete flexibility of operation. And when you put "Buffalo" Belted Vent Sets into the plan, you give your customers "Q" Factor performance — built-in Quality that means long life and satisfaction. *Write for new Bulletin 3720A* and data on new model Belted Vent Sets now being used for small induced draft applications.

ADJUSTABLE MOTOR MOUNT permits easy change of pulleys and belts for capacity changes after installation. See upper photo.

HIGH PERFORMANCE is built into "Buffalo" Belted Vent Sets. Note inlet guide vanes which reduce noise and stabilize performance.



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VENTILATING	AIR CLEANING	AIR TEMPERING	INDUCED DRAFT	EXHAUSTING
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ing organizations have the more extensive facilities and manpower that would be required for larger jobs. The Europeans, in turn, can offer engineers and technicians at a much lower price tag (and overhead) than comparable American engineering help. In certain fields, European specialists are better trained and more experienced than Americans. Because of nationalistic prejudices or political situations, a European firm may be in a more favorable position to negotiate the initial contract. And very often, a European firm may be better equipped to evaluate local engineering machinery that must be procured in Europe because of currency considerations.

As American consulting engineers become better acquainted with European consultants they will not only see opportunities for cooperation but they will also be spectators to important changes taking place in European industry that will eventually affect American interests as well.

European consulting engineers are still fighting for recognition—especially from the larger firms that maintain engineering departments in direct competition with consultants. These firms still use their own engineers to design power plants, steel mills, bridges, and other large products both at home and abroad—and in the face of what the European consultant regards as his rightful domain. These manufacturers agree that the engineering is not particularly profitable (manufacturing is their primary concern) and they would prefer to see independent consultants handle the work. But, they say their local consultants are too small to handle large projects such as a complete steel mill. The consultants, of course, have the argument that they cannot grow unless they can get in on these big assignments that would allow them to expand their staff and operations. If American consultants, who have already won this recognition from American industry, could lend their weight and prestige to the European engineers, it would greatly help their fight. It would also help remove some serious competition on foreign projects

Continued on page 76

CONSULTING ENGINEER



new **WIDER VISION**

for easier remote boiler
water level readings

■ Vastly improved visibility of remote boiler water level readings can now be enjoyed by boiler plant operators.

A new "wide vision" face on Yarway Remote Liquid Level Indicators allows reading from the side as well as front of the indicator. Boiler water levels and other liquid levels can be checked from most any position.

Indicating mechanism is operated by the boiler water level itself—assuring instant, accurate readings.

Yarway Indicators are of the manometric type with automatic temperature compensation, as approved for use under the recent A.S.M.E. Boiler Code Committee ruling in Case #1155.

Over 10,000 are used throughout industry for boiler water and other liquid level indication... and for superheater pressure differential indication aboard ship.

For full information write for Bulletin WG-1823.

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BRANCH OFFICES IN PRINCIPAL CITIES

A COMPLETE YARWAY SYSTEM

Besides Remote Liquid Level Indicators, Yarway also offers Liquid Level Recorders and Remote Signal Alarms... making a complete system for constant, accurate liquid level check.



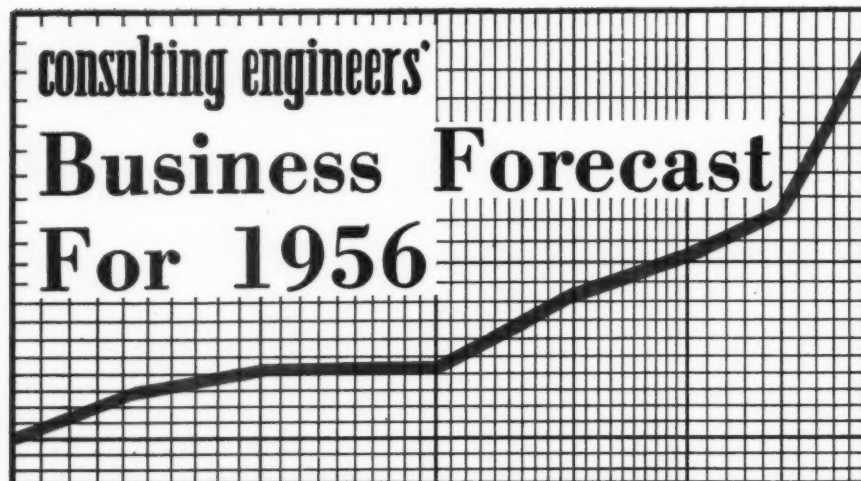
■ Yarway Hi-Lo-Graph Recorder provides not only water level indication, but also a 24-hour recording of water levels. See Yarway Bulletin WG-1830.



■ Yarway Remote Hi-Lo-Alarm Signals—lights or horns—can be placed at any location in plant. See Yarway Bulletin WG-1823.

YARWAY

**remote liquid
level indicators**



E. F. MAC DONALD
Industrial Economist

A FAVORITE ECONOMIC shibboleth is, "You can't have a depression as long as the construction industry is busy." If there is anything to this criterion, 1956 will not go down in history as the "Year of the Big Depression." But that is not much of a forecast. No one looks for depressions anymore. We are too smart now to let things go to pot the way they did in the early Thirties. At least that is what we are assured from many quarters.

Aside, then, from the likelihood that there will be no depression, it is expected that the upward trend in construction activity will continue—at a slower rate of increase—and will be a major force in the general prosperity of the next six months.

One of the cooperative ventures of the U. S. Departments of Labor and Commerce is the preparation of outlook estimates of new construction activity. The result of this union of very able minds late last year was a bullish forecast that construction put in place in 1956 will amount to \$44 billion—5 percent more than last year's total and an all-time high. The government economists pointed out that this good news was based on the assumptions, (1) that there will be at least a moderate rise in general economic activity, (2) that there will be available an adequate supply of investment funds to finance such a volume of construction, (3) that construction costs will continue to rise moderately, and (4) that increased plant capacity and rising productivity will prevent serious material shortages.

Turnabout

The government seers look for public works to be the prize performer this year. Contrary to the 1955 forecast of the two agencies—that public construction would lag behind the rise in the private sphere—the 1956 expectation is that the value of public works will increase 10 percent this year while private construction put in place will be dragging its feet with a gain of only 3 percent.

Despite steadily increasing outlays for capital projects since World War II, state and local governments have been hounded by a mounting backlog of construction needs. Pressure has been exerted by the widespread need for extending and expanding highways, schools, and water and sewer facilities. Expenditures for each of these three purposes will rise to new record levels this year and will account for about three-fourths of the increase in total construction outlays. Even at record highs, however, outlays in these three categories of public works will fall short of reaching estimated annual requirements for the next decade. Despite some indications to the contrary as, for example, the decline last year in state and municipal bond issues, construction outlays by state and local governments are expected to continue the unbroken rise of the last 12 years.

Federal outlays for military facilities will amount to \$1.5 billion, 14 percent greater than last year. This increase is a consequence mainly of airfield construction and other Air Force construction projects. For the first time in several years there will be an increase in the amounts expended for public housing and conservation and development. The only types of public construction expected to suffer declines are hospital building and Federal industrial building. A substantial drop of one-third in this Federal industrial building will be occasioned by the movement into its completion stage of the current program for construction of atomic energy plants.

The 1956 forecast is also turned about from last year's in the private sector. A year ago it was estimated that residential construction outlays would be stepped up 13 percent while nonresidential activity would rise only 4 percent. This year practically all the rise in private construction will come from a 14 percent increase in expenditures for nonresidential building. New residential building, on the other hand, is expected to decline about 3 percent. This decrease will be largely offset by greater outlays for additions and alterations to existing dwell-



Business Forecast -- 1720

Business forecasting and economic prophesying was not a regular business in 1720, but the Dutch did have their own unique way to warn the investing public of the dangers of speculation. They passed out playing cards.

It was not until April, of 1720, that the Dutch finally caught the speculation fever that for over a year had been rampant in both England and France. This was the period of the Mississippi

Bubble, backed by John Law, the radical Scotch financial expert. The fever did not last long in Holland, but it was intense.

A few heads remained cool during the months of wild speculation, and some unknown, probably self-appointed, financial expert designed and printed these playing cards, complete with doggerel verse, warning the suckers of the monetary disaster soon to follow their foolishness.

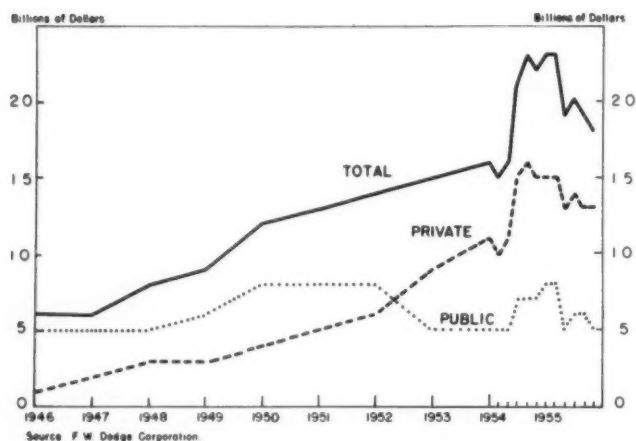
ings and for construction of motels and other non-housekeeping residential units. There will be no interruption of the trend toward larger and higher-quality homes. This, along with moderately higher building costs, should prevent dollar outlays from dropping as much as housing starts.

Factory Building on Rise

The big guns in nonresidential building this year will be in the category of stores, restaurants, and garages; in other nonresidential buildings such as religious, hospital, and institutional; and in the in-

dustrial field. The industrial category of construction will show the largest dollar and percentage gains. Sizable plant expansion is expected in the stone, clay, and glass industry group that produces such construction materials as cement, brick, ceramic tile, and window glass. Substantial factory construction is looked for also in autos, chemicals, electrical machinery, metal products, and steel.

There will be no decline in nonresidential building. In fact, aside from a reduction in outlays for new dwelling units, the only declines anticipated among all major categories of private construction



CONSTRUCTION AWARDS—AVERAGE OF 37 EASTERN CITIES.

are in farm construction, electric and gas utilities, and the relatively unimportant "all other" category.

If history repeats itself, the forecast of a 5 percent rise in total new construction outlays this year, from \$42 billion to \$44 billion, will be on the low side, and the actual gain will be substantially greater. Back in 1952, Commerce and Labor forecast that the increase in construction expenditures in 1953 would amount to only 1.5 percent; actually, a 7 percent gain was realized. A downturn was looked for in 1954, but when the actual results were tallied at the end of the year, a gain of 6.5 percent went into the records. The forecast last year was for a 7 percent increase amounting to \$2.5 billion—substantially lower than the actual gain of almost 12 percent or \$4.4 billion.

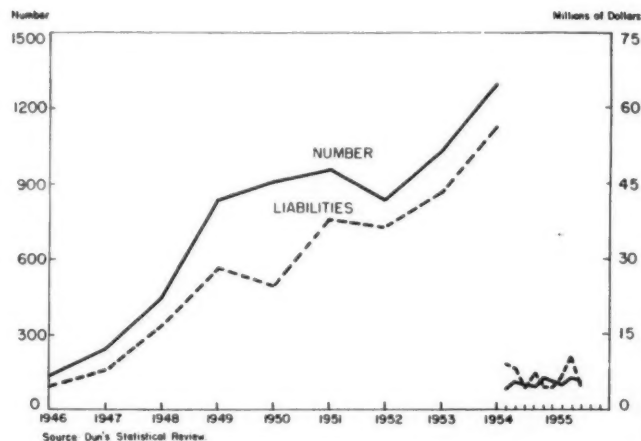
This could be the year when it would work out that the forecast was on the high side, but current indications do not lend impressive support to such conjecture. It is unlikely, however, that any increase this year will reach the proportions of last year's.

Not Out of Steam Yet

"... even after ten consecutive years of continuous increases in annual volumes of contracts and of construction put in place, the prospect for 1956 is for still another rise in over-all building and engineering volume." And so saying, the F. W. Dodge Corporation goes on to estimate a dollar volume of contracts to be awarded this year in 37 eastern states of \$25.2 billion, a moderate rise of 3 percent above the 1955 total.

Thus, while aggregate contract awards this year will continue on the up-trend, the head of steam built up will be a lot less powerful than it was 12 months ago when the industry was facing a year in which the dollar volume of building and engineering contracts increased 23 percent.

In acknowledgment of the effective braking applied to credit extension by the Federal Home Loan Bank Board and the monetary authorities, F. W. Dodge looks for a 6 percent decrease in the dollar volume of residential building contracts. Housing



CURVE OF ANNUAL RATE FAILURE FOR CONTRACTORS.

starts are expected to fall off about 10 percent, but the drop in outlays is moderated by making allowance for a slight rise in construction costs and for some up-grading of the quality of houses. The drop-off in the residential field will be more than made up by an anticipated rise of 9 percent in the dollar volume of nonresidential building awards. The net result is that total building contracts are expected to exceed the 1955 record by 1 percent. Contracts for public works and utility projects are estimated to be in line for a 13 percent gain. Altogether, the F. W. Dodge Corporation looks for a 3 percent rise in total contract awards.

In terms of physical volume of building, however, this authority estimates a 2 percent decline in total building floor space. This is a consequence of an 8 percent decline in the physical volume of residential building, as measured in floor space, which is not quite offset by a similar percentage gain in the non-residential building group. In the important categories of commercial, manufacturing, and educational building, estimated gains are 6 percent, 12 percent, and 10 percent.

Vote of Confidence

The Doubting Thomases must have been amazed and disconcerted by the results of the latest McGraw-Hill survey of business plans for new plants and equipment. This is no timid reading of prospects or presentiment of poor business conditions ahead. It is a forthright expression of confidence in the future—an extrovertish outlook based on the assurance that business is going to keep on growing.

In this preliminary survey McGraw-Hill found that business anticipates spending 13 percent more for new plants and equipment than it did last year when it invested a record \$29.4 billion. In view of the continuing high level of such outlays since the Korean War, a 13 percent increase in one year is nothing short of a boom. Anticipating sales increases averaging 7 percent, manufacturing industries as a group plan to step up capital spending by 30 per-

cent. As Hollywood would say, it's colossal. Plans of some of the individual industries are even more optimistic and ambitious: iron and steel producers plan the greatest expansion this year in the history of the industry and will spend 72 percent more than they did last year for new plants and equipment—the auto makers, feeling that the record production of eight million cars last year is their cue for the future, are going to boost and modernize capacity with capital outlays 68 percent greater than last year—and nonferrous metals industries will keep pace by spending 54 percent more this year than last for new productive facilities.

No Exceptions

The plans of manufacturing companies in the McGraw-Hill survey were summarized in 15 major industry groups. A planned increase is reported for every one of these classes. Not a single industry group feels it can stand pat or spend less than it did last year for new plants and equipment.

In fact, reduced outlays are in prospect this year for only two nonmanufacturing groups: mining and gas and electric utilities. The fast-growing petroleum industry will spend 6 percent more than it did last year; the commercial group will add 10 percent to its 1955 capital outlays; railroads will show a gain of 27 percent; and other transportation and communications industries will step up their capital outlays by 16 percent.

The McGraw-Hill survey covers, as indicated, plans for acquiring both new plants and equipment. At the time of this writing the breakdown of planned outlays as divided between new construction and durable equipment was not available. Besides the direct impact of outlays for new buildings, however, this survey is of significance to those connected with the construction industry because of the multiplier effect of spending for producers' durable equipment. The pervasive nature of such outlays—the leavening effect on the rest of the economy—has a very important indirect significance to the construction industry.

Credit Tightness

If construction activity this year is going to exceed last year's record, and if money is going to be relatively tight and expensive, will there be a sufficiency of capital funds to finance the estimated volume of construction?

For the most part, current thinking is in agreement with the position taken by the Government economists. Although construction outlays are expected to rise to record heights, the rate of increase is estimated to be materially less than it was this past year. The sharp expansion of construction activity in concurrence with booming business in 1955 gave rise to a total demand for funds that required increasingly severe adjustments in the credit

structure. As the economists pointed out, investment began to outrun available savings.

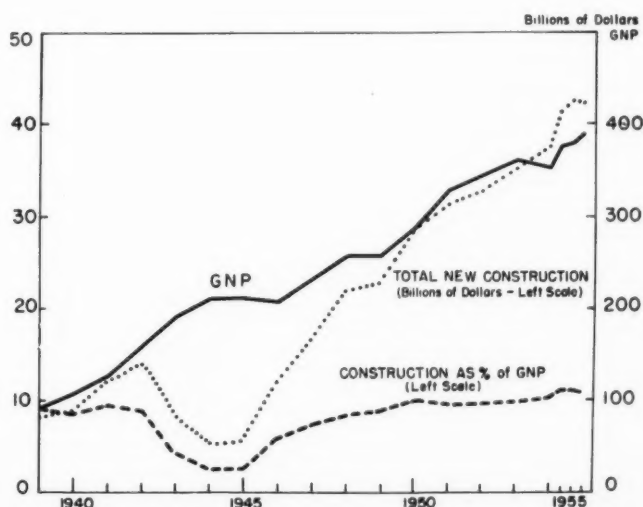
As the boom built up a broader and broader front during 1955 and as short-term funds of commercial banks began to be channeled in a swelling flow to mortgage lenders, the rate and nature of the credit expansion forced the monetary authorities to complete the change of policy from one of active ease to one of restriction.

Steps taken to nip in the bud excessive and too exuberant extension of credit are never likely to be popular. However, the pages of history tell more than one story of financial crises brought on by unsound credit expansion. There was no monetary authority in France in the early 18th century, for example, sufficiently informed to restrain the credit orgy set in motion by John Law's "System" for colonizing the Mississippi Valley. The failure to link up changes in the supply of money and credit with the value of the monetary unit led to a fantastic misuse of credit—the results of which were so devastating that it was almost a half-century before the French established another bank and trusted it with credit extension.

Internal Wherewithal

There can be no grossly improper use and expansion of credit in our country now. There do arise, however, periods of very rapid credit expansion when the monetary authorities feel it necessary to apply the brakes. It is not believed, however, that the tight credit situation at the turn of the year will prevent the indicated rise in construction activity in 1956. Residential starts in the last quarter of 1955 reflected tighter terms, and residential building went into the new year with a lot less ebullience than this time a year ago. It should be remembered, however, that housing activity started

—Continued on page 86



Source: Department of Commerce and Labor.

NEW CONSTRUCTION AND THE GROSS NATIONAL PRODUCT.



RADIANT CEILING IN ALCOA BUILDING HAS ALUMINUM COILS AND PANELS; INCLUDES ACOUSTICAL INSULATION.

The Case For Radiant Cooling

OWEN S. LIEBERG, Cosentini Associates

Cp exclusive SINCE CONSULTING ENGINEERS, architects, and owners alike recognize the necessity of air conditioning for all modern buildings, much progress has been made recently in developing systems to improve comfort conditions. In particular, air conditioning combined with radiant cooling and heating has provided advantages affecting capital investment and maintenance and operating costs.

Basically, air conditioning is a means of controlling the temperature, moisture content, and air movement in the enclosed space of a building used for human occupancy. The conventional central system comprises refrigeration for cooling, blowers and

exhausters for air movement, and heating coils for winter use. Such systems offer numerous advantages.

Air conditioning can be distributed to any location and controlled according to the requirements of areas or zones, whether they are outside rooms or inside, without restriction of length of throw or ceiling height. Typical central plants have an average useful life of 30 years, and major system components are concentrated into one central room, simplifying inspection and maintenance problems and minimizing labor requirements. Electric power demands are reduced to a minimum. Since the central plant is an integral part of the building, built into the general design of the individual floors during the engineering stage of a project, it readily lends itself to harmonizing with interior decorations.

Any arrangement, however, that can reduce the

The author is indebted to Wiggs, Walford, Frost and Lindsay and to Burgess-Manning Co. for illustrations and other data.

size, capacity, first cost, or maintenance and operating expense of the system components is of paramount importance to consultants, architects, and owners of modern buildings. Radiant cooling and heating with ceiling and wall panels not only fulfills all of these requirements but also offers many comfort conditions superior to conventional systems.

Radiant cooling is the reverse of radiant heating; that is, it absorbs the sensible heat. It is best used in conjunction with a modified, conventional air conditioning system. With this arrangement, the radiant cooling panels absorb the sensible heat while the conventional system takes care of the latent heat load and provides fresh air for ventilation.

One advantage of the combined system is that since the radiant cooling panel temperature always must be kept above the dew point, the dew point in the air conditioning system can be controlled and maintained at a minimum. Thus, the lower panel temperature substantially reduces the amount of air that must be circulated.

Combination systems also provide greater flexibility than the conventional central plant in maintaining room temperatures despite variations in load. Yet the operating and maintenance costs are less. The temperature of the air supply can be kept constant, and variations in cooling and heating can be taken care of by variations in panel temperature.

Cooling Loads

An analysis of the cooling loads in a typical office building will illustrate the demands put upon an air conditioning system.

Density of human occupancy. In a typical office building, a unit area of 1000 square feet will accommodate 15 persons comfortably. These 15 office workers represent a cooling load of approximately 6000 Btu per hour.

Lighting intensity. Good office lighting requires approximately 4 to 4.5 watts per square foot, or about 15,000 Btu per hour for a 1000-sq ft area.

Machine load. In an average office, the effect of business machines on the cooling load can be neglected. However, if certain departments have large concentrations of business machines in definite areas, the cooling load should be investigated.

Ventilation air. Fresh air requirements for office workers usually are estimated at 15 cfm per person. This fresh air volume must be cooled or warmed according to the external temperature, before being introduced into the main recirculation air stream. Cooling the fresh air for 15 people will require an extraction of approximately 17,000 Btu per hour.

Heat transfer. Heat transfer through the windows and wall structure, caused by the difference between the outside and inside temperatures and the solar load, materially affects cooling requirements. If the assumed 1000-sq ft area has an outside wall 50-ft long by 11-ft high, with 6-ft high continuous glass,

the cooling load will be about 18,000 Btu per hour.

The total of these cooling loads is 56,000 Btu per hour, or approximately 4 2/3 tons of refrigeration.

Horsepower for the compressor motor varies between 0.9 and 1.1 hp per ton of refrigeration, but for comparative purposes, it can be taken at 1 hp per ton. However, the compressor is only one part of the electrical load with the conventional air conditioning system. The heat from the compressor is extracted by circulating water through a cooling tower, which also requires the circulation of air. The horsepower to move this air and water is about 20 percent of the compressor horsepower.

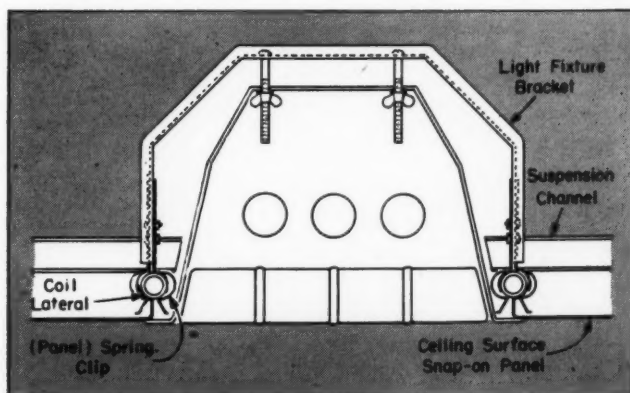
Further, the refrigerating cycle contains an evaporator—a heat exchanger having a refrigerant in one circuit and water in the other. Heat flows from the water into the refrigerant, producing chilled water. This chilled water is pumped either into coils in the air ducts or into radiant cooling coils. The horsepower required can vary considerably depending on equipment locations, but it runs from 7 1/2 to 20 percent of compressor horsepower.

It also is necessary to distribute the cooling and dehumidifying medium to the occupied spaces of the building—air in the conventional air conditioning system, or air and water with radiant cooling and air movement. The horsepower required for this service will range from 60 to 80 percent of the compressor horsepower.

Thus, there is a definite relationship between compressor horsepower and both the horsepower for associated equipment and the horsepower for air distribution in the conventional system or air distribution and water pumping in the combined system. The electrical load per 1000 sq ft of area served, however, is less with the combined system, leading to lower maintenance and operating costs.

Canadian Project

The Manufacturers Life Insurance Company building in Toronto, Canada, is an excellent example of the low electrical horsepower consumed by a combined radiant cooling and air movement system. The



TYPICAL ADAPTOR FOR RECESSED LIGHT TROFFERS.

project, designed by Wiggs, Walford, Frost and Lindsay, Consulting Engineers, of Montreal and Toronto, shows many marked advantages when compared with other conventional installations.

This building has a volume of 3,475,808 cu ft and a rentable floor area of 182,246 sq ft. Electrical horsepower per 1000 sq ft for the combined radiant cooling and air moving system, including compressor units, is only 4.71 hp. Since it is not unusual for buildings using air movement alone to require more than 25 percent more horsepower, this nominal electrical load indicates a substantial reduction in the size of the equipment installed throughout the building.

Air circulation at Manufacturers Life also is of interest. Air supply amounts to 0.33 to 0.4 cfm per sq ft of floor area in the interior of the building, and 0.6 to 1.0 cfm per sq ft of floor area along its perimeter, varying according to required comfort conditions. Contrast this with the conventional air conditioning system without radiant cooling and depending entirely on air circulation for cooling. Such systems use air volumes varying from 1 cfm per sq ft of interior floor area to 2 cfm per sq ft of floor area along the perimeter.

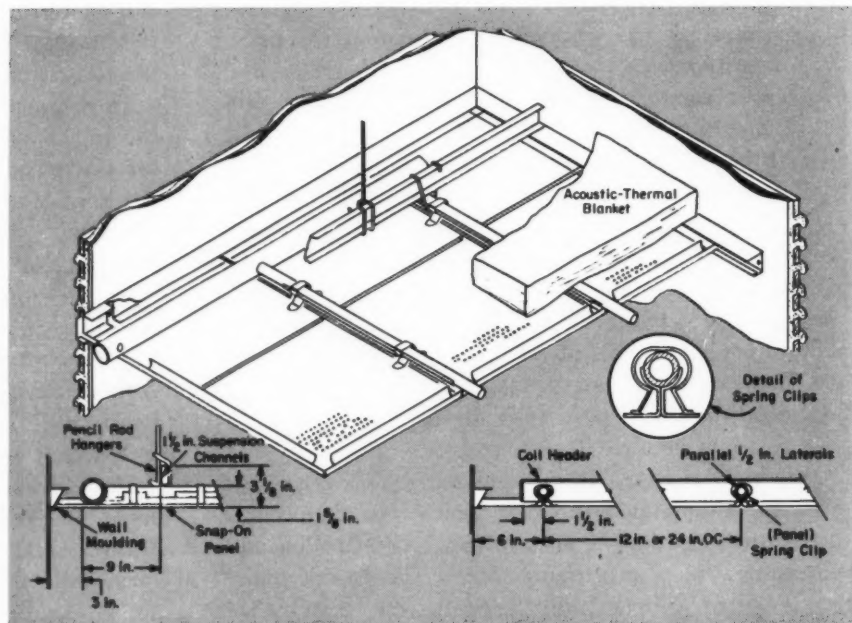
Designing Combined Systems

Systems with radiant cooling have sill units at each window (for design purposes a window is the extent of glass between mullions). These sill units provide radiant cooling in summer and radiant heating in winter. Their primary function is to offset the radiation from the windows to the occupants in summer, and from the occupants to the windows in winter. The panels consist of 1/2-in. diameter tubes that carry cold or hot water according to the season, and they fit tightly into extrusions of the sill panels.

Peripheral areas of each floor adjacent to the windows and outside walls are divided into circuits of serpentine coils — generally in series of four units and connected into branches and risers. Circuits are zoned according to the design required and to the building orientation. *The same tubes carry chilled water when cooling is required and hot water when heating is required.* A number of radiant panels also are provided to offset the effect of solar heat in summer, but these are shut off in winter.

Comfort Conditions

Conventional air conditioning systems require the movement of a relatively large volume of air which,



DRAWING SHOWS CONSTRUCTION OF TYPICAL BURGESS-MANNING CEILING USED FOR RADIANT HEATING, RADIANT COOLING, AND ACOUSTIC CONTROL.

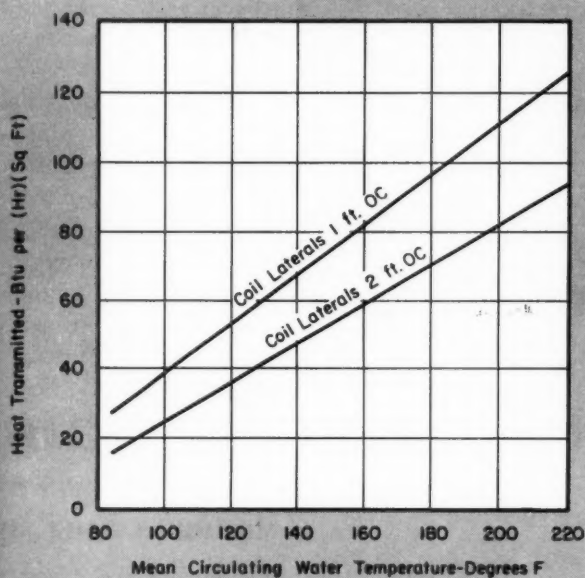
however well controlled and regulated, can and usually does subject occupants to drafts and discomforts according to locations. Systems combining air conditioning with radiant cooling and heating use a lower volume of air, reducing air movement to a minimum. Drafts at the comfort level are unknown.

It is an accepted fact that radiant heating provides greater comfort and more uniform temperature, from floor to ceiling, than is possible with any other form of heating. Radiant heating also costs less to operate and maintain. Since the same coils are used for both cooling and heating, radiant cooling also will cost less to operate and maintain than any other form of cooling. The temperatures of the cooling panels are controlled according to requirements, and by the use of zoning controls in relation to orientation and solar effects.

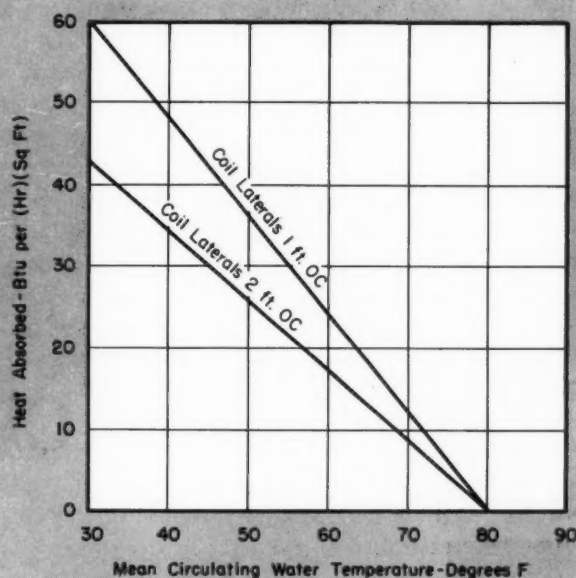
To offset heat loss or heat gain, separate cooling or heating panels are located on the outside walls where the heat transfer is greater, especially if the building has large areas of glass. Similarly, with the advent of radiant cooling panels, it is now possible to absorb the very appreciable heat load emitted by fluorescent tubes. Standard luminaire electrical fixtures have been developed with integral water-cooled extensions to absorb the heat emitted by the tubes. These cooling coils also absorb some of the heat given off by occupants in the vicinity.

Acoustical and Thermal Panels

Radiant-acoustic ceiling panels, combining radiant heating, radiant cooling, and acoustic control also have proved successful. These units have the advantages of being easy to engineer, simple to install, and competitive in price. They are completely



CEILING PANEL HEATING CAPACITIES FOR 70 F AIR & 65 F AVERAGE UNHEATED SURFACE TEMPERATURE.



Burgess-Manning
CEILING PANEL COOLING CAPACITIES FOR 80 F AIR & 80 F AVERAGE UNCOOLED SURFACE TEMPERATURE.

self contained, designed for fully automatic control, and provide both radiant heating and radiant cooling with the same coils. As shown in the illustrations, this system comprises perforated aluminum ceiling panels which are suspended to provide space above for supply or return air ducts. An acoustic-thermal blanket permits balancing the thermal requirements with acoustical demands.

For buildings with large areas of glass, the combined thermal-acoustic ceiling has many advantages. The use of water coils in such a ceiling assures complete freedom in selecting room or zone control. It facilitates changes in room partitions, the panels being easily removed to permit rearranging walls without loss of comfort conditions.

Radiant cooling and heating requirements to as high as 125 Btu per sq ft per hr can be satisfied, and at peripheral zones an even higher range is possible. The combination of air movement, cooling coils, and a perforated ceiling maintain ideal comfort conditions and make it virtually impossible to drop panel temperatures to dew point conditions.

Because of the high heat conductivity and low mass, the thermal lag is almost entirely eliminated. In fact, thermocouple tests show that the sensitivity to heat absorbed by the cooling coils is astonishing—even body heat from people moving into the area is quickly registered.

Another economic feature of the combined ceiling panel construction is the saving of weight. The aluminum pans and water-filled coils weigh approximately 2 lb per sq ft, or roughly 25 percent of the weight of a plaster ceiling. Snap-on panels also can be washed or redecorated without affecting the acoustic-thermal characteristics. Water-cooled light-

ing fixtures can be effectively incorporated in the ceiling design.

Summary

The advantages of air conditioning combined with radiant cooling and heating are as follows:

- ¶ Radiant cooling gives occupants a greater degree of comfort in summer because it absorbs the sensible heat of the body without uncomfortable drafts.
- ¶ Annual operational and maintenance costs are considerably lower than with the conventional air system because of the reduction in electrical horsepower and size of the air conditioning equipment.
- ¶ Radiant cooling and heating systems can be used successfully with acoustic ceilings in which four functions are combined—air movement, radiant cooling, radiant heating, and ceiling acoustics.
- ¶ Solar heat can be compensated by a simple control system that raises or lowers the water temperature to zones on the east and west sides.
- ¶ Air volumes and cooling coil temperatures can be varied in accordance with changeable climatic conditions. Such variations are controlled economically with the combined radiant cooling and air movement system, reducing operating costs.
- ¶ Air conditioning equipment takes less space when radiant cooling is used. Conventional air conditioning systems occupy from 15 to 19 percent of the building. With radiant cooling, radiant heating, and air conditioning, the system requires only 7½ to 12 percent of the building. The space saved increases the rentable floor area.
- ¶ Finally, buildings equipped with radiant cooling, radiant heating, and air conditioning are an added attraction to prospective tenants.



Reports the Client Can Understand

MORRIS SANDEL, JR.



ENGINEERS as a group can improve the communicative value of their reports in three ways: by changing the arrangement, by using visual impact, and by writing in an active tense.

Generally speaking, many engineers think reports should be presented in the same order in which they are developed. They assume that suspense invariably should increase through the introduction, data, and calculations until finally the climax is reached in the conclusions. This system frequently puts stumbling blocks between the reader and what he is searching for in the report.

Arrangement

Far too many engineering report writers have the idea that there is only one, or at most two, ways to arrange the sequence of events in a report. This is not by any means true. The accompanying list gives nine possible arrangements, and variations of these could provide many more.

Any client normally is interested in reading the results first when he opens a report. He would appreciate your making it easy for him. One consultant has accomplished this by making the first sheet of his reports a combination letter of transmittal and short summary. This page contains just a sentence or two of introduction, plus the conclusions. It is perforated at the bound edge so it can be removed easily for separate routing, or with proper reference to the bulk report, for filing in the client's personal file. The main report follows a logical sequence, and it is indexed for convenient reference.

One common error in arranging reports is to let the results creep forward into the introduction. This can be avoided by writing the introduction before detailed studies are started. At this point the writer has an objective viewpoint, and his information is limited to the basic problem at hand. If the in-

troduction is written at the conclusion of the studies, there may be a tendency to include data that are prejudiced because of subsequent findings.

Visual Impact

In most reports a few key sentences express the main thoughts, but often they are obscured by the remaining sentences on substantiating details. You can greatly aid your client if you use a technique practiced successfully by newspapers for years. Bring forward key sentences and push back detail sentences. Reports written this way have been called 3-D reports because they have the concept of the third dimension of depth added.

With the typed report an occasional crosshead, the proper placing of key sentences, and the use of spacing will provide visual impact. Various studies show that principally the first, and secondarily the last, sentences in a paragraph receive the greatest reader attention. If the lead sentences in your paragraphs signal the nature of the material to follow and attention is focused by crossheads, you will have provided a good scanning aid for your client.

These results can be accomplished readily if you will first develop an outline of the report that will indicate just what are the important points being covered in the report. Then read through the report and mark the sentences that express these points. These sentences should be rearranged within their paragraphs so that most of them come either at the beginning or end. This may, of course, require some rewriting of these sentences so that they fit properly in their new positions.

To call further attention to these sentences and the paragraphs that elaborate on them, use crossheads to call attention to them. These crossheads are simply the short paragraph titles such as the heading, "Visual Impact" as used at the head of

this group of paragraphs. Most casual readers will at least read the first sentence following one of these crossheads, so that is your chance to make a point.

You undoubtedly have noticed that newspapers, magazines, and books sometimes supplement this technique with special types and type arrangements including: all capital letters; italics; bold face type; and quote marks and exclamation points. However, in the typed technical report the use of counter-part visual aids should be approached with caution. Changes in style may bring emphasis to a word or sentence, but they also interfere with reading. It takes much longer to read a sentence that is written in all capital letters than it does one written normally in caps and lower case. Similarly, excessive underlining may detract from rather than enhance the appearance.

Active Writing

Another group of engineers, probably because of their desire to seem superior, or because they want to guarantee themselves a job, persist in using abstract terms and technical words. Concise, active words used by other successful writers today should be used by the engineer. For example, because they want to be impersonal in their writing and let the facts speak for themselves, some engineers are likely to write: "It should be noted that the results are predicated on the assumption that the market for chlorine will not be changed over a period of the next five years." It would be better if they wrote: "We assume that the chlorine market will remain constant for five years."

Abstract terms also are used by engineers who do not take the trouble to bring their ideas into focus. It is even less trouble to write nothing, and the communicative power is almost as effective. Clear writing serves both reader and writer because clear thinking is the first requirement of clear writing. Self-editing solidifies the writer's important thoughts and throws out unrelated details. To illustrate, an unedited sentence might read: "Economic conditions coupled with the situation in regard to its manufacture have caused the company to no longer engage in the manufacture of ethylene glycol." An edited sentence would read: "Low selling price and high production costs force the company to abandon the ethylene glycol operation."

Some engineers use abstract terms to avoid committing themselves; but few in top management got where they are by hedging. Directness and accuracy should be important elements of all technical reports. A hedging engineer would write: "It seems advisable under the present circumstances to conclude in effect that the results of the study are not too encouraging, since the return on the investment does not appear to be sufficient." An engineer writing directly would say: "The results of this study show that the return on the investment is insufficient."

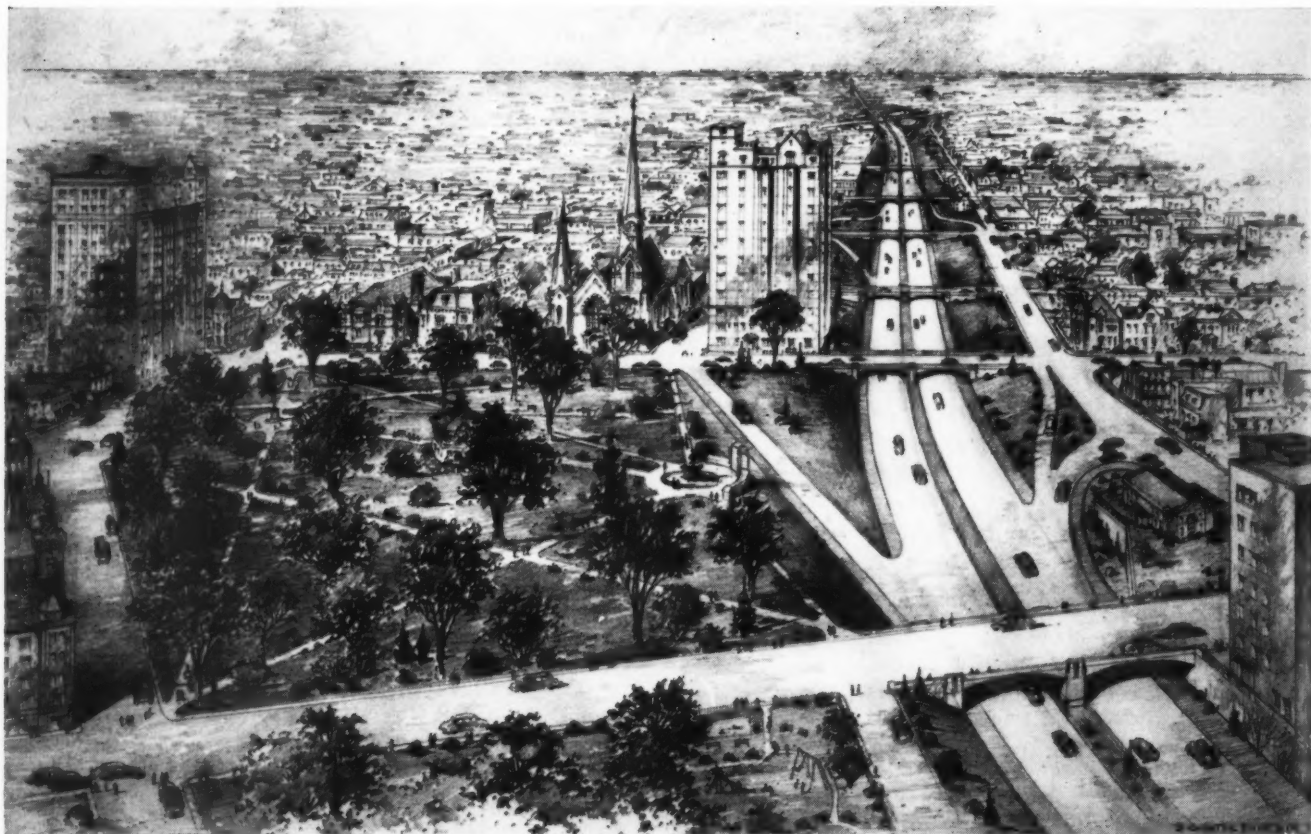
Engineers lacking confidence try to impress others with technical words. Young engineers who lack confidence because they lack experience are quick to fall into this habit, trying to sound professional so people will think they belong. The young engineer, having picked up a new term, might write: "The dehydrochlorination reaction was initiated when the 20-percent solution reached 200 F." The seasoned engineer would write: "Hydrogen chloride was given off by the 20-percent solution at 200 F."

Industry continues to expand—to develop new processes, new products, and new markets. Each phase is reported by a specialist in his field. Each report must communicate to nonspecialists or to other specialists with a minimum margin for error. Your client will appreciate your efforts to help him understand your ideas. ▲ ▲

NINE WAYS TO ARRANGE THE BODY OF A REPORT

Sequence	Explanation
Time Order (Forward)	Choose a certain date or period as a starting point and move forward from it. Tell what took place first, then what took place next, and so on.
Time Order (Backward)	Choose a certain date or period as a point of departure and move backward from it. Tell what took place at that time, then what took place just before that time, and so on.
Process (Forward)	Start at the beginning of the process and move forward from it. Tell what takes place in the initial stage, then what takes place in the next stage, and so on.
Process (Backward)	Start with the end product, the completed process, and move backward from it. Tell what takes place in the final stage of the process, then what takes place in the immediately preceding stage, and so on.
Space Order	Choose any one place as a point of departure and move geographically or spatially from it. For example, move from north to south, from top to bottom, from outside to inside.
Cause-Effect	Start with the cause of a given event or fact and move to the result, the event or fact itself.
Effect-Cause	Start with the result, the event or fact, and move to the cause of that event or fact.
Problem-Solution	Start with a description of the problem and move to an explanation of how the problem was solved.
Special Topical Order	Use the divisions that are customarily associated with a given subject; for example, assets and liabilities. Or use divisions that are peculiarly appropriate for a given topic; for example, types of objects in a given class (types of electric motors, for instance.)

University of Wisconsin, Extension Division



DRAWING BY CONSOER, TOWNSEND & ASSOCIATES OF A PROPOSED EXPRESS HIGHWAY THROUGH RICHMOND, VA.

The Consulting Engineer and Public Road Work

ROBERT MASON REINDOLLAR, Consulting Engineer

Robert Mason Reindollar started his career in highway work as a rodman for the State Roads Commission, of Maryland, in 1910. He became Engineer of Surveys in 1921, and Assistant Chief Engineer in 1929. During his tenure as Chairman of the Commission (1945-1950), Maryland accelerated its highway program from \$7 to \$50 million yearly. He is presently associated with the firm of Gannett, Fleming, Corddry and Carpenter, Inc.

IN FEW FIELDS of public construction has the consulting engineer demonstrated his talents to greater advantage than in the planning and design of modern highways. The highway engineer consultant holds his high stature because, in this age of rapid technological development, he is particularly qualified to

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perform unusual engineering jobs. No one would suggest that many of the nation's finest highway engineers are not right now on the payrolls of the state highway departments, but in this era of specialization there is plenty of room beside them, working in conjunction with them, for the consulting engineer with special training and qualifications.

The need for an accelerated highway building program to accommodate the rapid growth of motor vehicle volume, and to provide safe and efficient road transportation in the interests of the nation's security and economy, is an accepted fact. Whether America's highways will be built through a Federal subsidy or whether the work will be carried out piecemeal by the states and communities is an aspect of the problem that is largely political. The President and his advisors have suggested that it would be desirable if the nation, with substantial Federal help, would invest over \$100 billion in 10 years in modernizing

the nation's vital network of highways. The suggestion would have the states and communities carry the burden of this work, with the Federal Government assisting in the rapid completion of certain inter-state highways that may be accepted as a definite Federal responsibility. Studies, at the direction of Congress, are now being conducted that, it is hoped, will enable the Congress to iron out the difficulties in financing such a system, and pass the necessary legislation during this session.

This vast interlocking system of interstate highways, built to take the maximum strain of peacetime or wartime traffic, clearly requires all of the ingenuity that American engineering brains and mechanical techniques can produce. We are faced with the task, if we are to meet the highway challenge and avoid traffic strangulation, of designing and constructing thousands of bridges and tens of thousands of miles of modern-designed, paved thruways. The costs are overwhelming. At points it will be necessary to invest as much as \$15 million a mile to achieve highway transportation in urban areas.

What part will consulting engineers play in this expanded highway program?

Let us first break down the engineering functions of state highway departments to make clear the work that these agencies can either do themselves or that they might profitably turn over to the consultant. These general functions⁽¹⁾ are:

Policy — including provisions for financing, plan-

ning routes, priority for improvements, and conducting highway needs studies.

Administrative and fact finding—including counts of traffic volume and character, road life studies, planning surveys, and right-of-way acquisitions.

Appraisal of proposed projects.

Preliminary planning to set design standards and fix the route.

Preparation of plans and specifications.

Construction supervision.

Traffic engineering.

Research.

As a preface to how the consultant fits into the picture, it must be recognized that few, if any, state highway departments can afford to build up an engineering organization capable of handling all the problems of an expanded highway program. The outline above covers work expected from these departments from year to year. On such special projects as a toll road or a generally expanded interstate highway program these jobs may have to be telescoped into a relatively short space of time, requiring not only more engineers, but engineers with specialized knowledge.

Consulting firms have several powerful selling points in their favor besides specialized knowledge. Since they are not bound by civil service rules, they can build up their staffs rapidly for specific projects. They have the advantage of a fresh viewpoint, unhampered by day-to-day routine highway operations. And they have the advantage of familiarity with procedures employed by other agencies.

Legislative bodies, responsible for basic policy de-



VIEW OF PROPOSED ROUTE 1 AT RICHMOND SHOWS INTEGRATION OF PRESENT BRIDGES WITH NEW ROADWAYS.

cisions, such as financing and route location, have called on consultants for advice. Arrangements for reappraisal studies of the state highway system, its administration, and financing, are also part of the legislative body's responsibility. Since 1946 over half the states have had such studies made by engineers outside the highway agency itself.

Administrative Functions

In a rapid acceleration of all phases of highway building one of the first steps will be swift acquisition of rights-of-way. In this field alone the special services of the engineer consultant will be of great value. Continuing administrative and fact finding functions normally carried out by the highway agency, such as surveys to provide data for planning and operation of the state road system, might call for the services of a consulting firm specializing in traffic work.

On toll roads and toll bridges, for instance, a feasibility study is often required encompassing traffic estimates, route surveys, rough cost estimates, and financing studies. The consultant with his specially trained staff and backlog of experience can perform these studies with speed and efficiency without the stigma of favoring one interest above another.

Preliminary planning, which establishes the extent of the project, sets design standards, and fixes the route, is, in many instances, done by the state agency while the special design and drafting are turned over to a consulting firm. However, on work of a nonrecurring nature, such as the new, limited and controlled access highways with their many bridges, grade separations, and interchanges, special knowledge and skills are required.

Special Talents and Equipment

Part of the preliminary planning for these projects includes field surveys for final route selection — possibly by aerial photography — ground control, and making of topographic maps. This requires not only special engineering talents but special equipment. In this phase of planning, soil surveys, preliminary design of drainage facilities, and foundation exploration are accomplished and design standards are set. The consultant with his broad experience and the state highway engineers familiar with their state's needs can collaborate here to assure roadways that meet both present and future needs.

Consulting engineering organizations with a complete staff of engineers, draftsmen, and technicians are qualified to undertake all the engineering work on a highway project from the feasibility study to supervision of construction. A consulting firm may also take on any segment of the work such as preparation of plans and specifications with the highway agency drawing up original plans and supervising construction with its own staff.

Traffic engineering, aimed at getting maximum usefulness from the completed road, is a continuing

activity and as such may be executed by the highway agency or by a consultant on a retainer basis.

The state department that takes advantage of the consultants' services also reaps the benefits of the highway engineering research carried out by consulting firms with their own funds to increase knowledge in the field.

When the first revenue-bond financed highway project was being planned, embracing all of the features of denied access, with the numerous interchanges, ramps, and accelerating and decelerating lanes for the control of traffic flow, consulting engineers were engaged for its design and supervision of construction. The results created a demand for more roads in which these features of design were incorporated. The same high standards of design will be expected of the proposed interstate system.

Revamping State Agencies

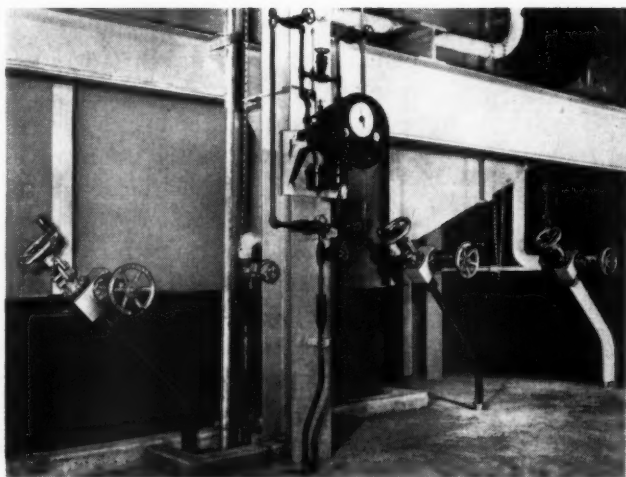
To meet the challenge that modern roads for the whole nation presents, we will have to utilize to the maximum degree the services of every available engineer with highway construction qualifications. The state highway departments must expand their engineering forces to sufficient size to handle all of their regular engineering problems and assignments.

As a consideration in making this possible, there must be a further review of the classification, duties, and responsibilities of engineers engaged in state services and a further upward adjustment in salaries commensurate with their responsibilities. Every effort should be made to attract qualified personnel including the induction of graduates from colleges and universities into the highway profession. Here again the consultant can be called in to advise state civil service boards as to the best means of improving and expanding state highway departments.

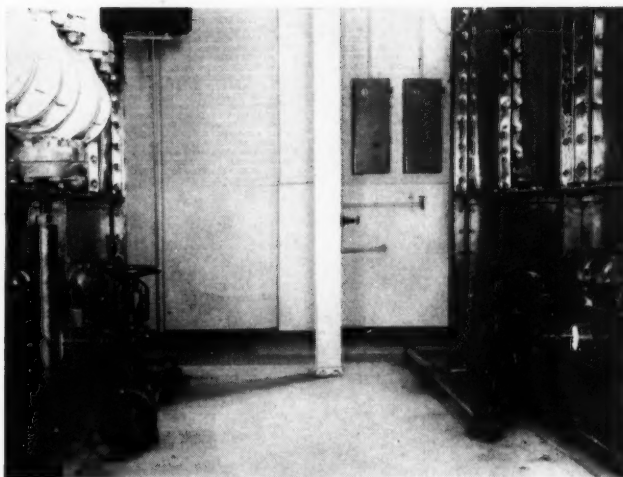
Such a review will strengthen the engineering departments and will assure greater harmony and cooperation between consulting and regular forces when they are placed in contact, as they must be, with the prosecution of specific assignments.

Once we have solved the riddle of governmental authority and means of financing, the pent-up public demand for a fast and efficient job in highway building will promptly manifest itself. I am willing to forecast that once a real national highway building program is started, there will be considerable impatience on the part of motorists to get the roads, bridges, and tunnels built.

Consulting engineering firms have demonstrated ability to perform valuable services in a most efficient and economical manner and with the dispatch required to place a facility in operation, within specified time limits, with inclusion of the best features of adequate and proper design. The utilization of these organizations, staffed with personnel of broad experience, will assure prompt and efficient action in any future stepped-up program. ▲ ▲



THREE UNIT TANDEM BLOW-OFF VALVES IN PLANT OF WEYERHAEUSER TIMBER CO. AT EVERETT, WASHINGTON.



TWO OF THE SIX 1½-IN. TANDEM BLOW-OFF VALVES ON WATER WALLS IN VETERANS ADMINISTRATION HOSPITAL, PHILADELPHIA.

Specifying High Pressure Blow-Off Valves

GEORGE W. SWITZER

**Mechanical Engineer
Gilbert Associates, Inc.**

J. SCOTT

**Mechanical Engineer
Yarnall-Waring Company**

Cp exclusive WITH THE NEWER power plants moving constantly to higher pressures and temperatures, the selecting and maintaining of boiler equipment is becoming increasingly important. Higher pressures are imposing greater forces, while higher temperatures are reducing the ability of the older materials to resist these forces. Boiler appurtenances must be chosen carefully, since outage time of the boiler is expensive and must be held at a minimum. Strict attention must be paid to maintenance procedures to guard against the wear and deterioration that may accompany the more severe service.

Blow-Off Valve Requirements

Blow-off valves are among the boiler components that must be selected carefully to meet these rigid requirements. It would be an unnecessary expenditure of time and money to be forced to shut down a boiler, particularly a large one, to repair or replace one valve part. Consultants responsible for modern power plant design must evaluate the important factors in blow-off valve selection and maintenance.

In modern high pressure boilers there are several points to be drained or blown down where the application of blow-off valves can be considered. Typical locations include water wall headers, circulator loop headers, and water wall feed drums.

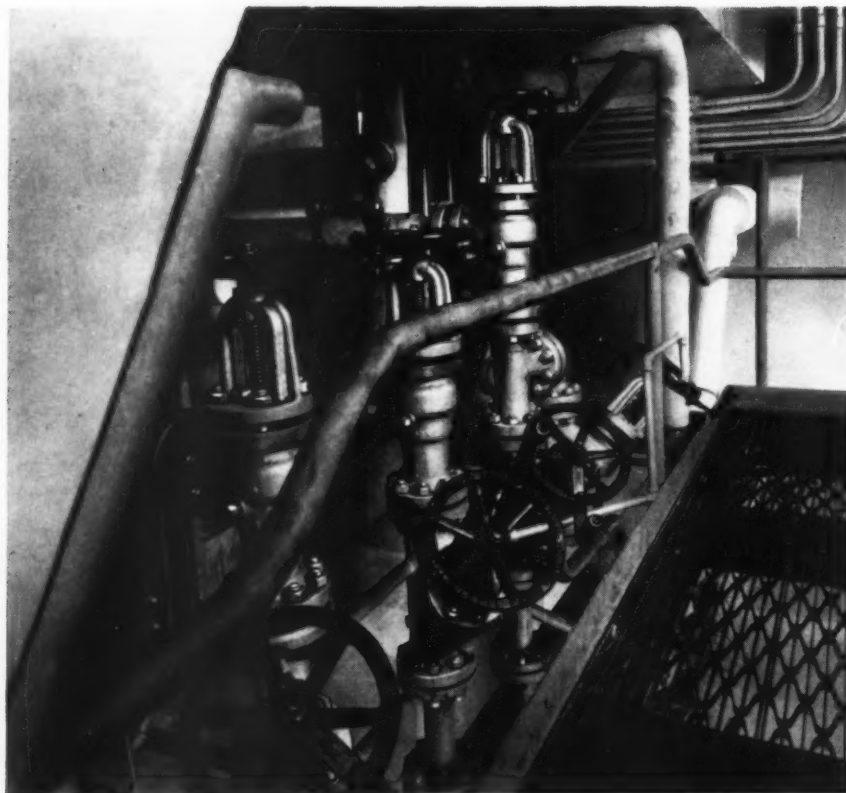
Usually, it is not considered advisable to blow down

from a water wall header while the boiler is being fired, since this may interfere with the circulation in the water wall tubes. Also, where the make-up is a small quantity and of high quality, and boiler water solids are kept low, frequent blowing down for removal of suspended matter is not anticipated. Under these conditions, considerations of first cost may lead to the selection of valves not especially built for the rigid requirements of blow-off service.

On every boiler locations should be selected where blowing down during operation is permissible to make it possible to reduce excessive water levels, which may be caused by malfunction of the feedwater control or "swell" from rapid increases in steam demand. These points and other drain locations may be such that suspended matter would be likely to accumulate, and all of them should be equipped with blow-off valves of the best possible construction. This also applies to boilers where the make-up contains appreciable dissolved solids and where relatively high values of concentrated solids are carried in the boiler. With high quality blow-off valves at all drain points, suspended matter can be blown down on a regular schedule or as firing conditions permit.

Pressure Requirements

The ASME Code, "Power Boilers," establishes the blow-off rating for valves in high pressure service. Carbon steel valves and fittings designed to American



YARWAY TYPE C SEATLESS TANDEM BLOW-OFF VALVES AT SHUFFLETON PLANT OF PUGET SOUND POWER & LIGHT CO., IN RENTON, WASHINGTON.

Standards Association specifications are limited to an adjusted pressure rating for blow-off or feed line service. Steel valves and fittings are given primary pressure ratings in the superheat range (800 F for flanged and 850 F for welded or ring joint connections).

Table 1 shows basic pressure ratings at corresponding saturated steam temperatures and maximum allowable boiler pressures for feed line and blow-off service. Note that an ASA 1500-psi carbon steel valve with ring joint or welded connections may be used to 2500 psi for saturated steam service but is limited to 2325 psi for blow-off service. Blow-off valves usually are listed according to the basic pressure rating and blow-off rating, and not the saturated steam rating. When selecting a blow-off valve, be sure the valve has a blow-off rating equal to or greater than the boiler operating pressure.

Material Requirements

Careful consideration should be given to materials in the valve to assure as long a service life as possible at a reasonable cost. Blow-off valve bodies usually are made of cast or forged steel (unless corrosion is a problem), and they should be of sufficient thickness to guard against failure of any kind. ASA and Code requirements set a minimum thickness that is adequate under most conditions, but engineers responsible for boiler plant design frequently specify heavy-duty type valves as an additional safeguard. These valves are designed to give good service under

the most rigorous conditions, and the extra protection against expensive emergency shutdowns more than justifies the cost.

Most manufacturers have standard materials for their valve trim that has been selected to resist corrosion and erosion. Corrosion could be caused by acid washing or feedwater treatment, while erosion may be caused by either the liquid or solids in the liquid passing through the valve. Blow-off valves usually have the acid cleaning solution pumped through them at relatively high velocity. The high velocity can increase corrosive action during the filling period, and erosion and corrosion are present again at the time of acid discharge.

Materials such as the Hastelloys and chrome-nickel stainless steels are resistant to corrosive attack by the acid cleaning solution. However, when these metals are in contact with low carbon steels the corrosive attack on these materials is reduced but the attack

on the plain steel may be accelerated. Use of such corrosive resistant materials may cause excessive damage to the steel valve body.

Taking into consideration such factors as hardness and resistance to erosion and corrosion, the selection of valve trim materials becomes a real problem. A compromise may prove necessary, with selection based on valve trims that have been found suitable by research and field experience.

Valve Trim

Valves with hard cone disc and seat with inlet under the seat (Fig. 1), suitable for blow-off pressures up to 3206 psi, may have the following trim for acid wash service:

Stem and disc nut	#303 stainless steel
Disc and seat	Stellited carbon steel
Stuffing box bushing	Ni-resist

The trim for seatless blow-off valves as shown in Fig. 2, for applications where acid washing is not contemplated, may be as follows:

Plunger	Nitralloy
Upper gland	Brass
Lower gland	Brass

Where acid washing is to be used, the blow-off valve trim materials should be:

Plunger	#317 stainless steel
Upper gland	Chrome plated steel tubing
Lower gland	Ni-resist

Service life and satisfaction may be increased by using as large a valve as is economically possible.

TABLE 1—MAXIMUM BOILER PRESSURES FOR USE OF AMERICAN STANDARD STEEL PIPE, FLANGES, FITTINGS, & VALVES

Adjusted pressure ratings for steel flanges, flanged fittings, and valves							
Type of joint	150	300	400	600	900	1500	2500
Maximum allowable saturated steam pressure at corresponding saturated steam temperature							
Standard facing	180	510	665	960	1360	2100	3150
Ring joint	190	630	820	1160	1640	2500	3206
Maximum allowable boiler pressure for feed line and blow-off line under this paragraph & P-310							
Standard facing	150	415	540	785	1170	1910	2975
Ring joint	160	515	665	970	1450	2325	3206

Courtesy ASME Boiler & Pressure Code, 1955 Addenda

Larger valves permit faster, cleaner blows that reduce the time the valves, drums, and headers are exposed to corrosive attack from acid cleaning solutions or to erosive attack from entrained solids. Blow-off valve sizes run from 1 to 2½ inches for boilers with more than 100 sq ft of heating surface.

Maintenance

Preventive maintenance usually is the most effective method for assuring good service from blow-off valves. A well-planned schedule of lubrication and examination increases valve life and prevents serious difficulties. Most manufacturers recommend maintenance procedures and provide spare parts lists that are worth careful consideration. Remember, manufacturers have had years of experience and know what is needed to keep the valve in good condition. It is to their advantage when their product gives good service at the lowest possible over-all cost.

In some plants blow-off valve maintenance is increased by the operating procedure. There is a tendency to use the downstream valve of a tandem set as the blowing valve, with the thought that the outside valve can be serviced without a boiler shutdown. However, at installations with seatless valves (Fig. 2) in tandem, closing of the inside valve after the downstream valve has been closed results in excessive pressure between the two valves. A virtually noncompressible column of water will exist between these valves, making it necessary to exert an excessive handwheel force. If this closing force fails to seal the packing rings, some compressed water could be forced from its location and cause wiredrawing of the glands or packing rings.

High temperature lubricants usually are recommended to prevent the lubricant from draining away from the surface requiring

lubrication, and to prevent corrosion. The entire valve becomes warm, if not hot, while in service, and ordinary oils and greases become thin and run off. Some oils and greases can break down under prolonged high temperature and may actually cause a corrosive attack on the lubricated surfaces. Valve manufacturers can recommend the proper lubricant for their products.

Periodic inspection of the valve internals can prevent serious consequences. If it appears that some part or parts are wearing, they should be replaced to spare a potential headache at a later date. This may seem expensive at first, but if the boiler goes off the line, considerably more expense may be incurred before the manufacturer can supply a new part or complete valve even though they are stocked.

In order to undertake and perpetuate a satisfactory maintenance program, it is important that the valves, be readily accessible. If it is easy for a man to get to the valve, there is greater certainty that the maintenance schedule will be followed.

Careful consideration of these factors plus the results of previous experiences should help consultants select the valve that will give the best performance for their client's applications. ▲ ▲

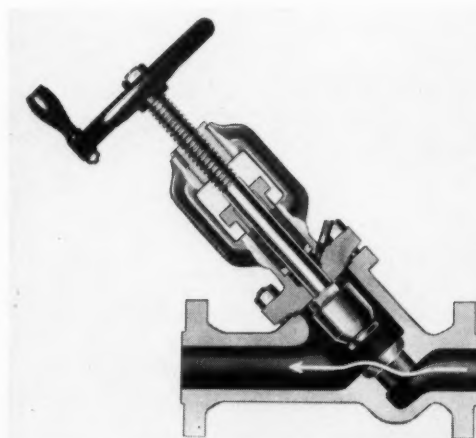


FIG. 1—HARD-SEAT TYPE BLOW-OFF VALVE, YARWAY STRAIGHTWAY IN OPEN POSITION.

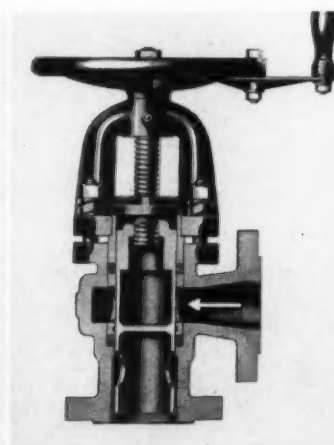


FIG. 2—SEATLESS BLOW-OFF VALVE IN CLOSED POSITION.



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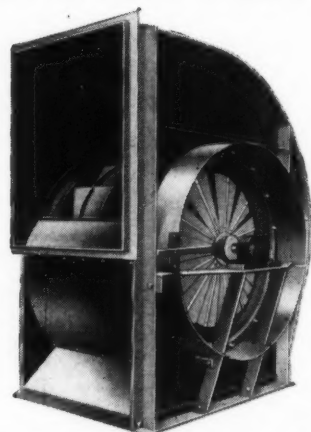
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Throughout this modern building, containing 190,000 square feet of floor space, air handling is by Clarage equipment.

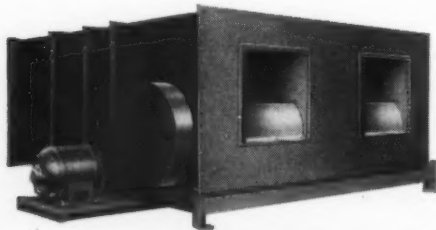
Clarage products shown on the right and below are representative of those selected for Metropolitan Edison's new office and service headquarters.

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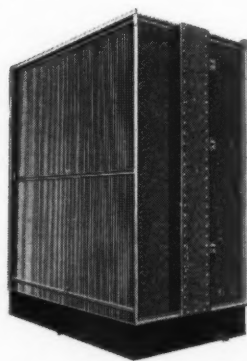
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Clarage Type NH fans for ventilating, air conditioning, and various industrial process services.



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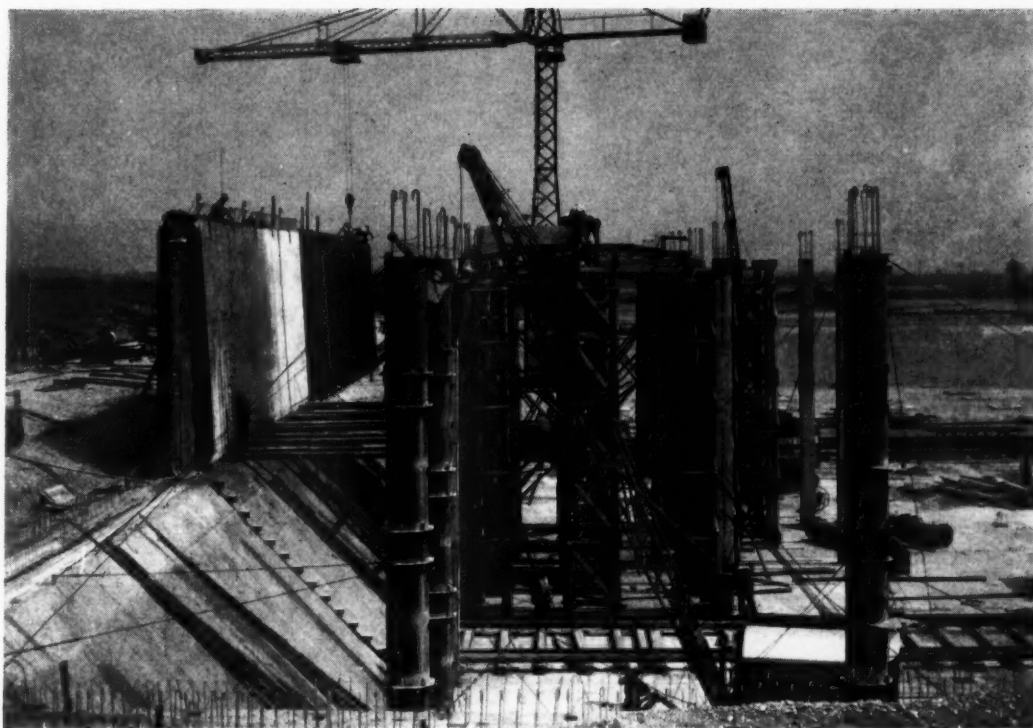


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METAL FORMS ARE USED FOR ALL CONCRETE POURS TO ASSURE SMOOTH WALLS AND COLUMNS.

Vienna Builds Europe's Largest Tank

FREDERICK H. BAER

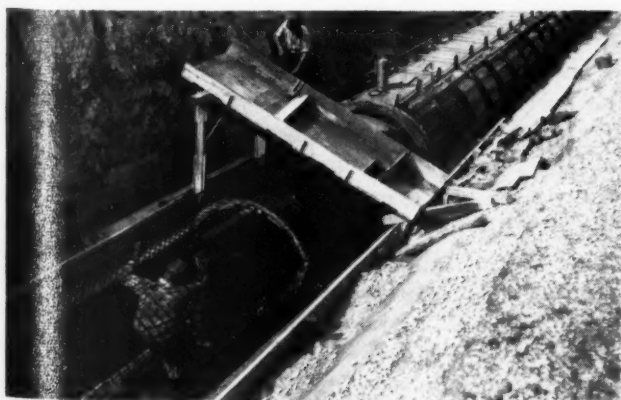
VIENNA'S expert-run Water Works currently is constructing a water storage tank that will be Europe's largest when completed in 1958. This project is the first step in a planned program to supplement an existing supply system consisting of two pipelines from

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Alpine wells, eleven ground-water works, and related storage facilities. Seepage wells also are being installed at the tank site to develop additional ground-water reserves, which can be tapped later—probably after 1965 — by a proposed third pipeline. These combined facilities will assure a steady and adequate water supply to meet the sharply increasing demands imposed by both Vienna's 1,700,000 inhabitants and the process operations of industrial consumers.

Preliminary Studies

Since no data were available on tank structures of the size contemplated, exhaustive studies were conducted for three years prior to the start of construction in 1953. A study group, using Vienna's largest existing storage tank as a test model, investigated such design problems as: highest permissible water storage level, temperature exchange within the structure, flow characteristics and turnover of water within the tank, internal-external temperature gradients, and construction details for the large tank buildings. Readings were taken with a set of twenty-five recording thermometers installed at the intake, outlet, underside of the ceiling, air pocket above the



INTAKE AND DISCHARGE LINES SERVING THE TANK CONSIST OF AN INNER CEMENT LAYER, AN ARMOR LAYER, AND AN OUTER PRESSURE RESISTANT LAYER.



PANORAMIC VIEW SHOWS FIRST CHAMBER DURING CONSTRUCTION PERIOD. WHEN ALL FOUR CHAMBERS ARE COMPLETED

water's surface, the external earth cover, the walls, and the bottom, middle, and top strata of the water.

Tank Design

From the test results, it was decided that the tank should be divided into four equisized, equilevel chambers to obtain the desired volumetric capacity. Each chamber will have net internal dimensions of approximately 390 feet by 440 feet, and when arranged in line, with the 390-ft dimensions accumulative, the over-all structure including external embankments will be about 1640-ft long and 490-ft wide. Allowing for the internal embankments, ceiling support columns, and hydraulic equipment, the four-compartment structure will provide a total storage capacity of 158.4-million U.S. gallons when filled to the estimated permissible level of 33 feet.

Each chamber will be equipped with a water jet system to assure even flow. With this arrangement, it will be possible to reach a four to five times higher water speed, and to draw between three and four times more water through the jet venturi into the tank. This will prevent the formation of temperature strata within the water. Calculations indicate that with the anticipated demand variations, the average retention time will be five days. It is expected that fresh air, coming through the water pipe's culotte from the Alpine well area, will pass over the water's surface in the pipeline and the tank at a higher speed than the flow rate, thus insuring good cooling and aiding in keeping the water fresh.

Site Details

The site selected for the tank and seepage wells is in the Steinfeld area — about 31 miles south of Vienna and halfway to the Alpine wells. This loca-

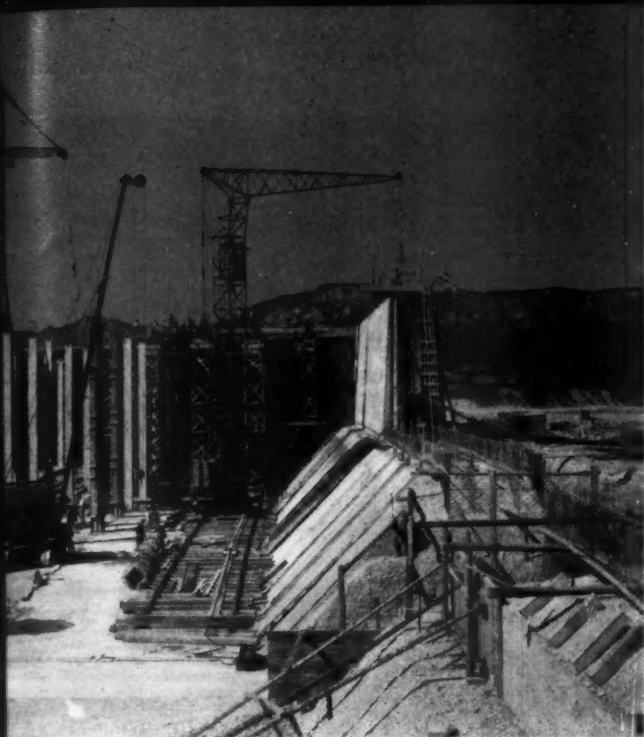
tion has several advantages. It is close to both a Federal road and the railroad line and also carries part of the larger of the existing pipelines. The ground slope averages 10 percent, allowing the use of gravity to fill the storage tank's chambers, and no pumping equipment will be required outside of the city limits.

Geological analysis of the site revealed a ground structure of compact gravel below a 1.5-ft layer of topsoil, with a resistance against bearing pressures of at least 85 lb per sq in. This permitted the use of heavy equipment for excavating, transporting, and cementing. Ground-water level was measured at about 98 feet, and dry excavation was used in reaching the desired 23-ft depth for the bottom of the tank structure. The favorable site characteristics also influenced the decision to raise the total water head to 33 feet, the highest known to date for a storage container of this type and physical size.

Watertight Concrete

In view of the extensive experience in Austria with watertight cement and high water heads, design details of the construction are of interest. Inspection of the various sealing methods — tarpaper, lead layers, pure cement face coatings, and special paints — used on the existing storage tanks revealed that all of them showed the influence of pressure, temperature, and movement. Thus, to avoid similar difficulties and to assure watertightness at all points, a special concrete incorporating sealing provisions as an integral part of the mixture itself was used for all components of the entire four-compartment storage system.

This concrete consists essentially of hydraulic cement combined with a special mixture of pozzolanic type aggregates. Batches are carefully prepared at the job site, poured into metal forms, and com-



STORAGE CAPACITY WILL BE 158.4-MILLION U. S. GALLONS.

pacted uniformly by hard shaking. Using metal forms for all walls and columns assures smooth, tight surfaces and eliminates the need for any face treatment.

Construction Details

As shown in the photos, the tank compartments are reinforced concrete throughout. The ceiling columns are approximately 20x20 inches, and they extend about 4.6 feet through the floor to spread footings, each with 43-sq ft bearing area. The floor itself has a primary layer 7.87-in. thick, and this will be covered with a 2.34-in. layer of sealing concrete after the compartment is completed. This procedure of placing the top floor layer as the final step is to assure equalized temperatures throughout the structure, avoiding later tensions and resulting cracks.

When completed, the ceiling will consist of a 4.7-in. thick concrete slab, covered first by a watertight 2-in. layer of clay and then an 18-in. layer of humus earth. The ceiling is designed to carry this overburden and the usual weight of snow encountered in the area, plus a safety margin of about 405 lb per sq ft. Embankments will slope from the roof cover to grade level, making the entire four-compartment storage tank essentially a buried structure.

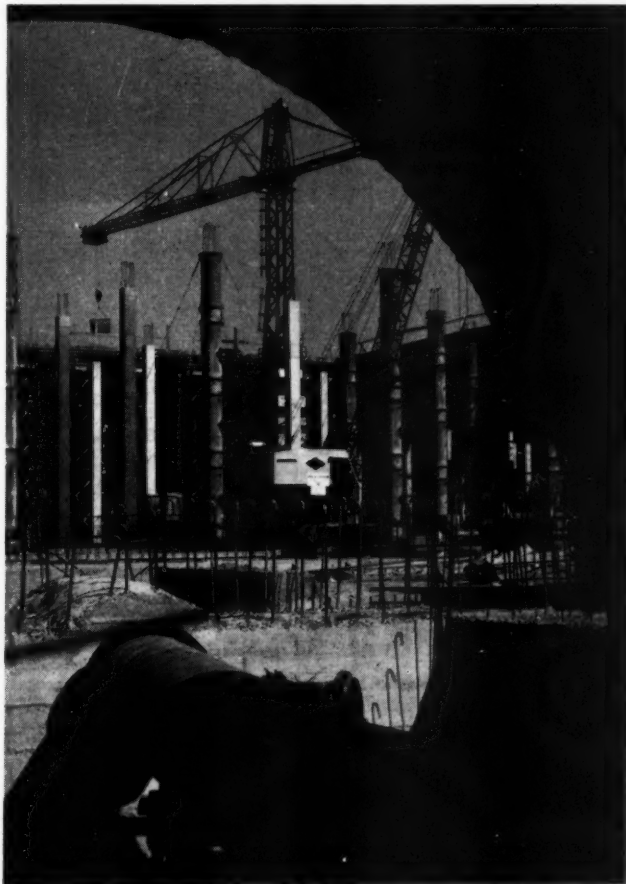
Pipelines and Seepage Wells

Even the main intake and discharge lines from the gravity water channel to the tank's four-chamber distribution network will be of concrete construction. These lines will be made up of an inner cement layer, an armor layer, and an outer pressure resistant layer. No paint or other special surface treatment will be needed. After a short sweating period, sintering is expected to make the concrete pipe sections of the intake and discharge lines 100-percent watertight.

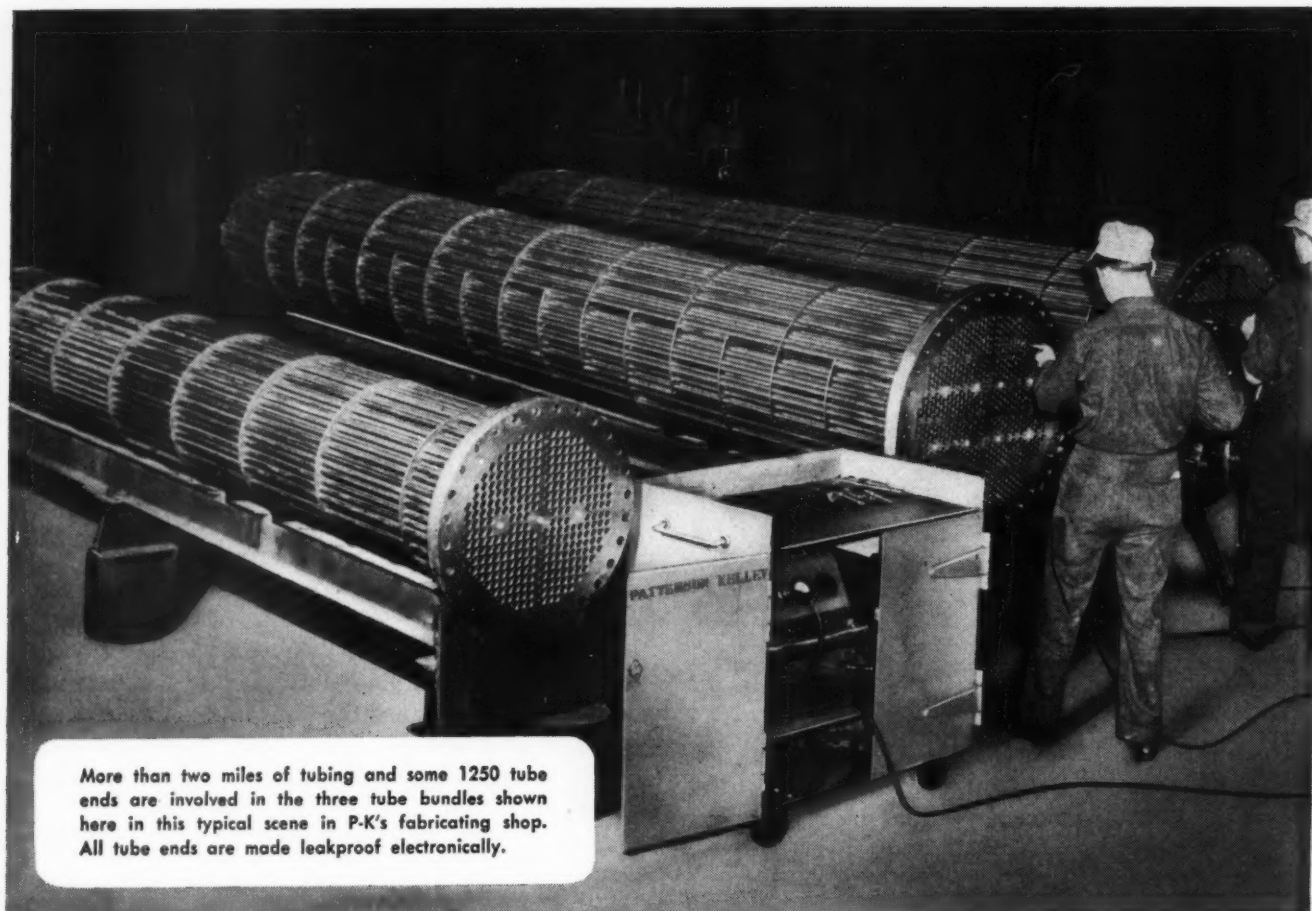
Since the capacity of the section of the main pipeline between the Alpine wells and the new tank exceeds the capacity of the section between the tank and Vienna by approximately 10.5-million gpd, seepage wells also are being constructed at the tank site to build up ground-water reserves. Each well will have an inside diameter of slightly over 13 feet, and they will extend to the current ground-water level of 98 feet. Estimates indicate that a water column of about 65 feet in the well will provide an absorption rate of 264 U.S. gallons per second. Reserves thus developed are expected to become the supply source for the proposed third pipeline. This addition to the water supply and distribution system is tentatively scheduled for construction in 1965.

Estimated Cost

Because of its size, and especially its high water head, this new storage tank will be less expensive per unit volume than the next most recent Vienna storage basin, built in 1936. That unit has a maximum capacity of 39.6-million U. S. gallons, or exactly the same volume as one of the four new compartments. It cost (in 1953 currency equivalent) \$1,384,610. On the same basis, the estimated cost of the new four-compartment network is only \$3,076,920. ▲▲



EACH OF THE FOUR CHAMBERS WILL HAVE ITS OWN INLET AND DISCHARGE TO PERMIT VARYING WATER LEVELS IN THE SYSTEM. BRANCHES ARE IRON PIPE.



HOW ELECTRONICS MAKES P-K EXCHANGERS BETTER THAN EVER

These men are expanding tube ends into the tube sheet—the “inner face” of a shell and tube heat exchanger that holds each tube in place. It's a time-consuming, precision-demanding job. Yet by doing it *electronically* with the equipment you see here, the circumference of each tube is joined to the face of the exchanger with exactly the same pressure. The fit is as nearly perfect as modern science can achieve. No leaks can develop in service because of the precise and uniform expansion of the tubes.

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Consulting Engineers Plan European Tour

PRELIMINARY PLANS are now being made for a trip to Europe for a party of consulting engineers during the month of May, 1956. The tour will be set up so that in each of the countries visited, the American consultants will meet with the local Association of Consulting Engineers.

As currently planned, the tour would leave New York on the evening of April 29 (with morning pickups in San Francisco and Chicago), arriving in London on Monday, April 30. Return would be from Paris on May 27, with stops in New York, Chicago, and San Francisco on the following day. In between, the group would visit England, Holland, Germany, Switzerland, and France.

The trip is being planned to make the visit as enjoyable as possible. All plane reservations, hotel reservations, and baggage details will be handled for the travelers. Arrangements will be made for meetings with European consultants both in groups and by individual appointments. Trips to points of engineering interest in each country will be arranged. On the other hand, there will be no formal program to occupy every minute of the visitors' time. Everyone will have plenty of free time to go where he wants to go and see what he wants to see.

Since the trip will be made on regularly scheduled flights on TWA, it will be possible for anyone to return earlier or later than scheduled.

The trip is being conducted by **CONSULTING ENGINEER** magazine to establish a closer relation between consulting engineers of this country and Europe. It will be an opportunity for prominent consulting engineers from this country to meet with outstanding European contemporaries. There is much we can learn from each other. This will be a business trip for professional men in private practice.

You will have a chance to learn of new European techni-

cal developments of direct interest to American consultants. You will be able to see how European engineers have managed their professional development, their relations with architects, manufacturers, contractors, and other engineers. At the same time, your wives will have a chance to take that European trip they have been planning—in the company of a congenial group.

The President of the International Federation of Consulting Engineers, Julian S. Tritton, assures us that we will be welcomed by the Associations of Consulting Engineers in each country visited. This will be a rare opportunity for American consultants to discuss mutual problems with Europe's most prominent engineers in private practice.

Wives are more than welcome, and a special program of interest will be arranged—teas at embassies, visits to points of interest, and special showings at the salons of fashion leaders. Yet, again, while the program will be available, no one will be required to follow a formal tour schedule. If, for example, a few days on the Riviera are more appealing than a sojourn in the Alps, that can be done.

The round-trip fare, first class will be slightly less than \$850 per person from New York. Hotels and meals will be about the same as in this country. This means an easy trip with plenty of extras should cost less than \$1500 per person for the month. The trip will be limited to about 60 persons.

If you would like to make the tour, fill in the coupon below immediately and mail it to **CONSULTING ENGINEER**. You will be sent all the information currently available on the programming and estimated costs. Get together a group from your office or your local consulting engineer's association.

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Send further information on the European Tour.

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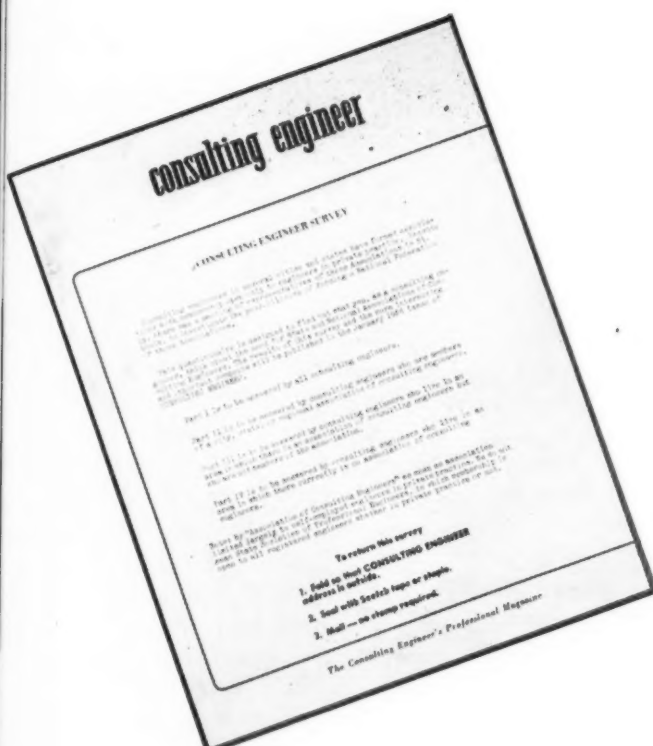
Name _____
Title _____
Firm Name _____
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City and State _____



What The Survey Said!

STAFF REPORT

Here are the results of a survey recently sent to the readers of *Consulting Engineer* to determine their feelings as to the need for regional and national associations to represent them.



EXCLUSIVE EARLY IN DECEMBER, a four-part survey was sent to all the engineers in private practice on *CONSULTING ENGINEER*'s circulation list. The survey was designed to find out what consulting engineers think about the need for city, state, regional or national associations with memberships confined to engineers in private practice.

This subject of consulting engineers associations was selected for this year's survey because of the current interest in the subject brought about by two recent and independent actions. One was the meeting of 10 state, city, and regional associations of consulting engineers in St. Louis, the end of October, at which it was decided that they would work toward the formation of a National Federation of their local organizations. The second action was one taken by the National Directors of the National Society of Professional Engineers in setting up "Functional Groups" within their organization, one of these to be a Consulting Engineers' Group.

Throughout the country consulting engineers are discussing these two actions. It comes down to this: Will the interest of consulting engineers be better served by the formation of a National Federation of state, city, and regional associations to which only engineers in private practice belong, or would it be better for all concerned to have consultants represented by NSPE through one of the Functional Groups. There are excellent arguments on both sides.

These arguments were fully presented at the St. Louis Meeting and reported in the December *CONSULTING ENGINEER*. All the arguments now have been given, and it is time to see how the consultants, as a group, feel.

The pages that follow present the results of *CONSULTING ENGINEER*'s Survey. The actual percentages are taken from a 1000 item sample made up of returns selected at random from each mail. This sample system was used to simplify the preparation of percentage figures. However, on several questions the entire return was studied and compared with the sample, which consistently proved representative within 1 percent.

A surprising fact came out in studying the returns as a whole. About 28 percent were incorrectly filled out. This came about through a lack of information. For example, about a third of the answerers from Chicago did not know of the existence of the Chicago Association of Consulting Engineers. Therefore, they answered the part of the survey that was supposed to be answered by consultants living in an area in which there is no association. This happened in many other parts of the country—even in New York City and California, where very old and well known associations exist.

On the other hand, some who answered stated that they belonged to an association of consulting engineers and filled out the survey accordingly, when there actually is no such association in their area.

This came about through a confusion of types of associations. While the front page of the Survey clearly defined an association of consulting engineers as "an association limited largely to self-employed engineers in private practice," many of the returns listed membership in such groups as the Western Society of Engineers, and numerous State Societies of Professional Engineers, none of which limit their membership to engineers in private practice.

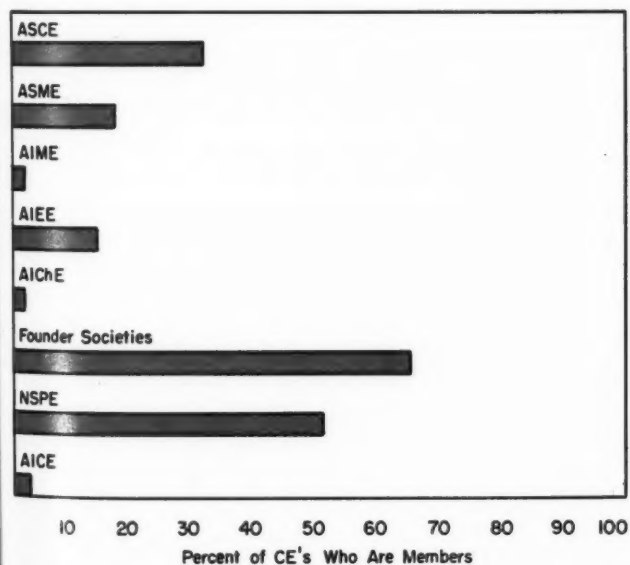
In preparing the statistical results, each of the four parts of the survey was considered independently. Therefore, the returns that were incorrectly filled out in one part were thrown out of the count only for that particular part of the survey. Correctly answered parts were tabulated. This means that everyone's answers were counted except where the answer was based on an error in fact.

All of the returns have been filed, and any returns received after this writing will be added to the file. These returns are now and will be available to any interested engineering society or association that would like to check the results or study the returns in greater detail.

Part I

Part I was designed to be filled out by all who received the survey.

1. Of which of the following organizations are you a member?



a. Amer. Soc. of Civil Engrs.	32.4%
b. Amer. Soc. of Mechanical Engrs.	18.9%
c. Amer. Inst. of Min. & Met. Engrs.	2.5%
d. Amer. Inst. of Elec. Engrs.	15.9%
e. Amer. Inst. of Chem. Engrs.	2.3%
f. Nat. Soc. of Prof. Engrs.	51.6%
g. Amer. Inst. of Consulting Engrs.	3.3%

It will be noted that NSPE is far ahead in consulting engineer membership. In fact, slightly more than half of all consulting engineers belong to the National

Society. However, if all the Founder Societies (and AICHE) are taken as a group, 66.1 percent of all consulting engineers belong to one or more of those engineering societies. Some consultants belong to more than one of the Founder Societies, but the figure of 66.1 percent is arrived at by counting each multiple membership as if it were one. This means that NSPE is well ahead of any other single society in its consulting engineer membership, but it is below Engineers Joint Council, which here can be considered as representing the Founder Societies as a group. It is interesting to note that 13.7 percent of the consultants are non-joiners — they do not belong to any of the societies listed in the survey.

2. Do you think it would be wise for the various city, state, and regional associations of consulting engineers to form a national association?

Yes 76.2% No 18.3% No opinion 5.5%

When one considers that almost 14 percent of those answering are strictly non-joiners, most of whom are against any kind of organization, the 76.2 percent who would favor a National Association of consulting engineers is surprisingly high.

The 18.3 percent who oppose the formation of an association had two reasons. Either they felt there were too many organizations now, and that it would be wise to disband a few rather than add another; or they felt that consulting engineers were already being well represented by the National Society of Professional Engineers, and that any additional society would be not only superfluous but harmful.

3. If so, do you think the association should have an office in Washington and take an active interest in legislation affecting consulting engineers?

Yes 87% No 13%

These figures represent the opinions of only those who answered "Yes" to question 2. Naturally, if the answerer did not want an association, he could not want an office in Washington. The returns on this question show that of those who want an association, almost nine out of ten felt it should be an active lobbying group looking out for the interests of engineers in private practice. It is quite likely that this strong feeling of need for a lobby is at least partially due to consultants having been forced into the Social Security program, while doctors, with their strong AMA lobby, were able to stay out. There are other factors, too. Consultants who deal with government agencies are conscious of being squeezed between the architects and the contractors, both of whom have powerful lobby groups.

4. Do you think membership in this national association should be on the basis of:

a. Individual membership	49.9%
b. Firm membership	20.0%
c. State or regional society membership	22.1%
d. Other	1.7%
No opinion	6.3%

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Half of the answers indicated a preference for individual membership in a National Association. Preference for membership by firm membership or by local society were about equal. Certainly, this shows a desire by consulting engineers to have a direct voice in the operation of any National Association of consulting engineers.

5. What would you consider a maximum annual dues for such a national society?

- a. For individuals \$28 (average)
- b. For firms \$135 (average)

Averages here are confusing. Actually, most of the answers indicated \$25.00 as the proper amount for individual dues, with a scattering of \$50.00 figures raising the average to \$28.00. There was a much greater range for Firm Dues. Most thought \$100 about right, but many favored \$500, and some few went up to \$1000. Evidently, consulting engineers are willing to give excellent financial support to any association that truly represented their interests.

6. Which of the following would you consider as necessary qualifications for membership?

- a. Registration in some state 70.9%
- b. Engaged only in private practice 60.2%
- c. Partners or principals of a firm 44.0%
- d. Also member of some Founder Society 17.0%
- e. Also member of Nat. Soc. of Prof. Engrs. 20.8%
- f. Other 6.1%

If a simple majority were to have their way on this question, members in an Association of Consulting Engineers would have to be registered in some state and they would be engaged only in private practice of engineering. However, almost half feel that membership should be limited to partners or principals of firms — that this should be an association of employers rather than employees. This is a very important point, for much of the criticism consultants now direct at the National Society of Professional Engineers is based on the fact that NSPE is predominantly an employee group.

Questions 7, 8, and 9 give infor-

mation about the persons answering the Survey.

7. Are you registered in any state?

Yes 97.5% No 2.5%

8. Are you a partner or principal in your firm?

Yes 85.7% No 14.3%

9. Does your firm do any work other than that of consulting engineering?

a. Sales 2.7% b. Mfg. 2.8%
c. Contracting 6.7% Other 10.1%

Almost all who answered are registered in one or more states, almost nine out of ten are either partners or principals of their firms, and very few do any sales or manufacturing. Nearly 7 percent do contracting work as well as engineering, most of these coming from the large engineer-constructor organizations. The 10.0 percent who say their firm does "Other" work is not as significant as it would seem, for practically all of these are answers from architect-engineer firms, and they listed their firm's "Other" work as Architecture.

Part II

This part of the survey was answered by all consulting engineers who are members of a city, state, or regional association of consulting engineers.

1. What is the name of the consulting engineers association to which you belong?

This question was used to test the answerer to make sure that he was a member of some association of consulting engineers and was not confusing this with membership in some other engineering organization. A great many of those answering the survey did answer this part incorrectly in that they listed the name of some State Society of Professional Engineers or some other technical or professional organization whose membership is open to engineers in industry or in other non-consulting activities. Since this part of the survey was designed to find out what members of the various associations of consulting engineers felt about their own associations, only those who listed correctly the name of a consulting engineers association were counted in this

NEW

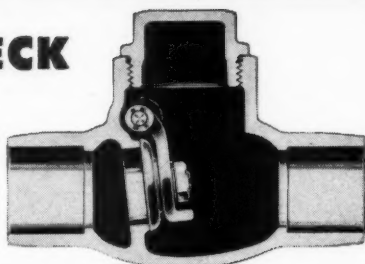
LUNKENHEIMER

SOLDER-END VALVES

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SWING CHECK

FIG. 2145
½" to 2"
125 lb. S.P. 200 lb. W.O.G.
Renewable
Bronze Disc and Side Plugs



Now you can take advantage of the superior quality, advanced design, and outstanding performance of famous Lunkenheimer Bronze Valves for your copper tubing installations!

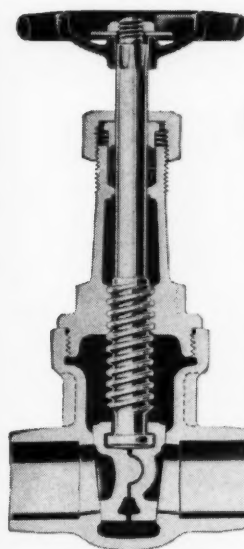
The complete line of five patterns, with precision machined bores and ends, is designed for use with types K, L, and M copper tubing.

In operating features, materials, and workmanship, these valves are identical with the corresponding Lunkenheimer figures in the Screwed-End Bronze Valve series:

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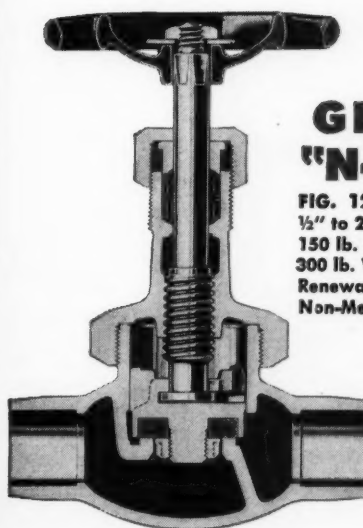
GATE

FIG. 2131
½" to 2"
125 lb. S.P.
200 lb. W.O.G.
Rising Stem
Double Wedge Disc

FIG. 2132
Solid Wedge Disc

FIG. 2133
Non-Rising Stem
Single Wedge Disc

Easier, tighter
installation!
Lasting, trouble-
free service!



GLOBE "N-M-D"

FIG. 126
½" to 2"
150 lb. S.P.
300 lb. W.O.G.
Renewable
Non-Metallic Disc

L-855-18

BRONZE • IRON • STEEL • PVC

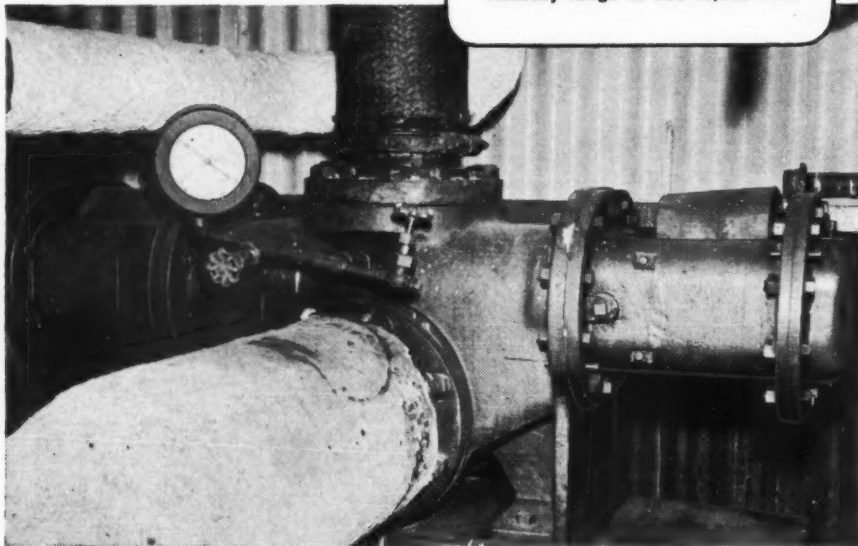
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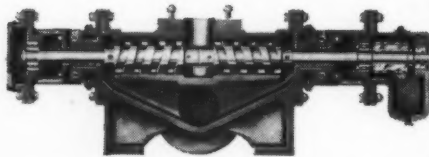
Dependable Pumping for Power Plants!

Sier-Bath SCREW PUMPS

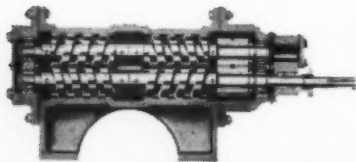
Consolidated Edison, Kips Bay Station, New York City, has been using two Sier-Bath Screw Pumps in Bunker "C" fuel oil service for the past four years, with negligible downtime and maintenance. Pumps are in continuous 24-hour per day service. Pumps are driven by 75 hp., 880 R.P.M. motors and deliver 200 gpm. at 200°F. and 165 psi., with a viscosity range of 500-10,000 SSU.



Sier-Bath SCREW PUMPS



External Gear and Bearing Bracket Type for non-lubricating liquids and semi-liquids



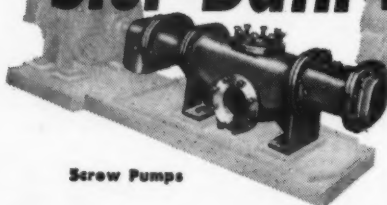
Internal Gear and Bearing Type for lubricating liquids and semi-liquids

Sier-Bath Screw Pumps maintain high volumetric efficiency because "Dual-Controlled" precision rotor design prevents rotor-to-rotor or rotor-to-casing contact—provides a continuous flow without pulsation, hammering or vibration . . . without strains, misalignment and wear on rotors, shafts, bearings and gears.

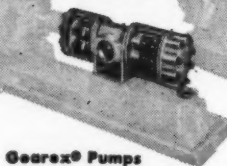
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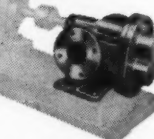
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part of the professions survey.

2. Do you attend meetings?

Regularly 67.5% Occasionally 22.5% Seldom 10%

If these relatively abstract words "Regularly," "Occasionally," and "Seldom," are to be taken literally, then consulting engineers are good meeting attenders within their own organizations. Any group that can point to 67.5 percent of their members as regular attenders is in good shape.

3. Do you hold any office in the association?

Yes 20.6% No 79.4%

The answers indicated that this question was interpreted as meaning past as well as present, for many of the answers listed such offices as "past president" and "ex-director". However, just about a fifth of all of the members have served or are serving as officers of their association.

4. Do you work on any committee?

Yes 50% No 50%

It is well known that the more members working on committees, the more active a group is likely to be. The fact that exactly half of the members of consulting engineer associations are working on committees is an indication of healthy and active societies.

5. In which of the following activities does the association engage?

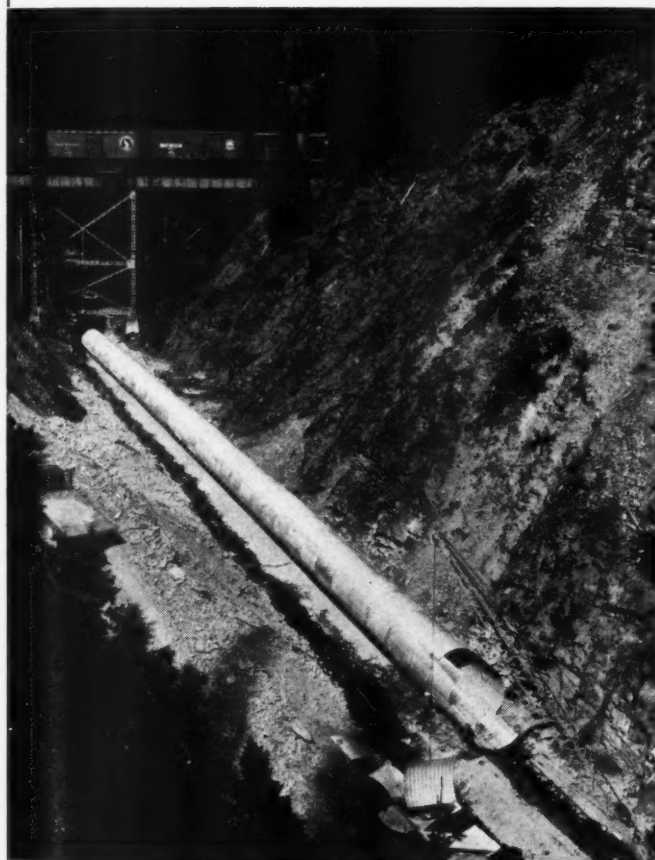
a. Publishing fee schedules	44.9%
b. Ethical practices	86.3%
c. Technical negotiations	18.7%
d. Engineer-client relations	68.0%
e. Education	34.9%
f. Local legislation	61.7%
g. State legislation	67.0%
h. Social	16.3%
i. Protection of members' financial interests	26.8%
j. Other	6.7%

It should be recognized that this group of answers does not indicate the true scope of activities of the associations. It shows what the members think the associations engage in. This is important, for activities carried on without the knowledge of members are seldom fruitful. It would seem that Ethical Practices, Engineer-Client Relations, and Legislation are the fields in which the members think their associations are most active. Looking back at the reports pre-

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sented by the officers of the various state associations at the St. Louis Meeting, it would seem that the members' opinions are generally correct. These are the fields in which most of the associations are doing their best work.

6. *In which activities does the association do the best job?*

The returns clearly showed that Ethical Practices, Engineer-Client Relations, and Legislation were those fields in which the members thought their associations were doing the best job.

7. *In which activities does the association do the poorest job?*

Education led the field here. Apparently, few of the consulting engineer associations feel that they need to do educational work. This is left to the technical societies. Local Legislation was also high on the list of jobs poorly done. Since this category also showed up as a field in which the associations were doing a good job, it can only be assumed that some associations are doing well and some poorly in this category.

8. *Do you feel that the dues in your association are:*

Too high 7.9%	Too low 15.4%
About right	76.7%

Apparently there is no great problem with regard to dues. Twice as many thought their dues were too low as too high. Most of those who thought their dues were too high were members of the California Association where dues are based upon income from private practice. These California dues go as high as \$500 per year.

9. *Do you think your society membership adequately represents the consulting profession in your city, state, or region?*

Yes 64.5%	No 29.2%
No opinion	6.3%

Here, two out of every three think their society membership adequately represents the local consulting engineers. Many of the "No" answers were based on a belief that the membership was too small. Many also felt that too little effort had been made to bring in additional membership.

10. *Is there any tendency for one or two large firms to dominate the organization?*

Yes 5.7%	No 88.0%
No opinion	6.3%



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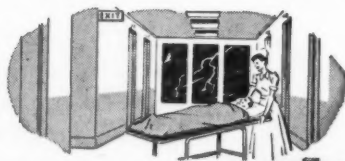
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It would appear that there is no great problem here. When a question of opinion shows only 6 percent on one side, very little trouble is brewing. Furthermore, a thorough inspection of all the returns indicated that those few who felt their society was dominated by one or two large firms were well scattered among the various associations. No single association seemed to suffer from this particular evil.

11. Do you think membership requirements are:

Too strict 2.4%	Too loose 8.1%
About right	85.7%
No opinion	3.8%

Again, there does not seem to be any problem.

12. Do you consider your association to be usefully active on behalf of its members?

Yes 81.4%	No 7.6%
No opinion	11.0%

While the "No opinion" group here is relatively large, a very great percentage of the members think their associations are doing good work. A check back on the "No" answers against Question 2 shows that most of those who feel their association is of no use are from the group who indicated in Question 2 that they seldom attended meetings.

Part III

This part of the survey was to be answered by consulting engineers who live in an area in which there is an association of consulting engineers but who do not belong to the association.

1. What is the name of the consulting engineers association in your area?

This, as in Part II, was a test question. Only those answers that gave the correct name of a consulting engineers association or an approximation of that name were counted in this part of the survey.

2. Have you ever belonged to this association of consulting engineers?

Yes 1.0%	No 99.0%
----------	----------

We see that practically all of the answers to this part of the questionnaire are from consulting engineers who have never belonged to an association of consultants even though there is such

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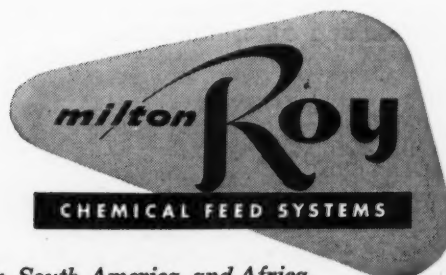
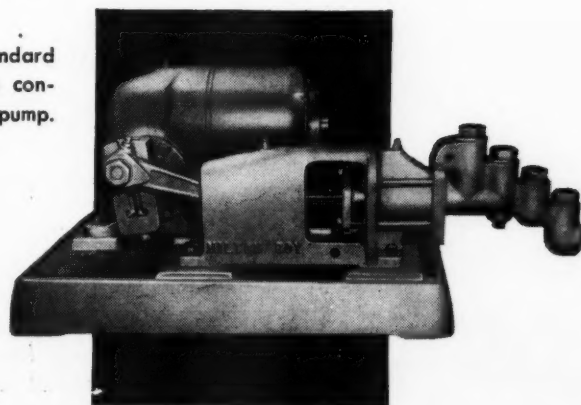
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an organization in their area. Only one out of a hundred of those answering had once belonged and then dropped out.

3. Have you ever been asked to join?

Yes 24.0%

No 76.0%

Approximately a quarter of the consultants who live in an area where they could belong to an association of consulting engineers have been asked to join but for some reason refused. It is rather surprising to find that three-quarters have never been asked. This is despite the fact that the questionnaire shows practically every one of these men qualified so far as registration, position within their firm, and type of work done by their firm is concerned. Apparently, the various associations of consulting engineers have not done too good a job of recruiting members.

4. Would you consider joining now?

Yes 50.1%

No 49.9%

This is a very interesting percentage; slightly over one half of all the consulting engineers who do not belong to associations in their area would consider joining. It also is interesting to note that 30 percent of those who have turned down an offer in the past would consider joining now. Despite this fertile field for recruiting among those who have changed their minds, those who have never been asked to join still represent the largest group of potential new members.

5. If you would not join your local association, what is your reason?

The reasons for not joining varied from differences of political opinion to lack of interest in any kind of organization. In California, most of the reasons given for not belonging were that another partner in the firm belonged, and therefore the firm was adequately represented. Many of those not interested in joining stated that they felt that their State Society of Professional Engineers was doing a more than adequate job. It appears that the State Societies of Professional Engineers are doing a particularly good job of representing consultants in Ohio; Houston, Texas;

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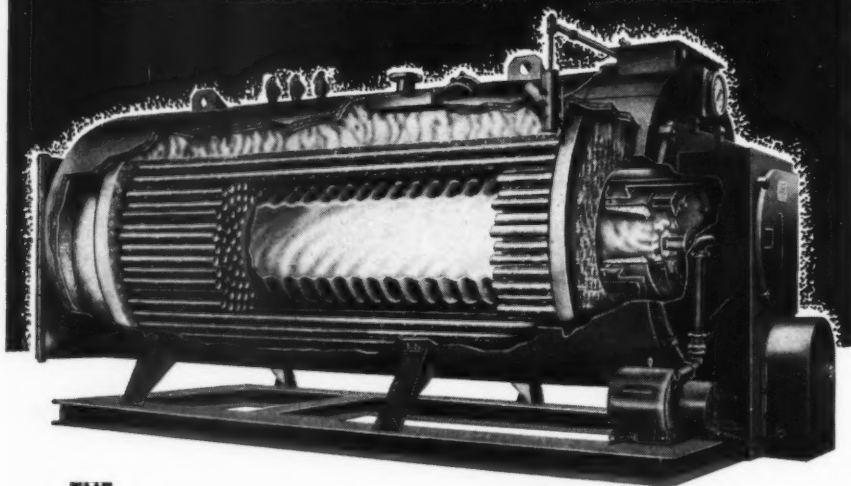
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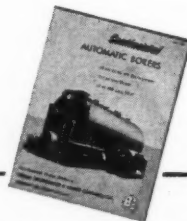


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and Kansas City, Missouri. Returns from these areas strongly favored representation by their State Societies of Professional Engineers and NSPE.

In New York and Chicago, a very large group stated that they did not know enough about the local association to know whether they were interested or not.

6. If your local association of consulting engineers were to affiliate with a national association of consulting engineers would you be interested in joining?

Yes 76.8%

No 23.2%

Compare this answer with Question 4. Whereas only half of those who are not members of their local association at present would be willing to join if asked, more than three-quarters of them would be interested in joining if their local association was affiliated with a national group. This clearly indicates that having a national association for the local groups would make them much more attractive to those consultants who are not now members.

7. What is your opinion of the usefulness of your area association?

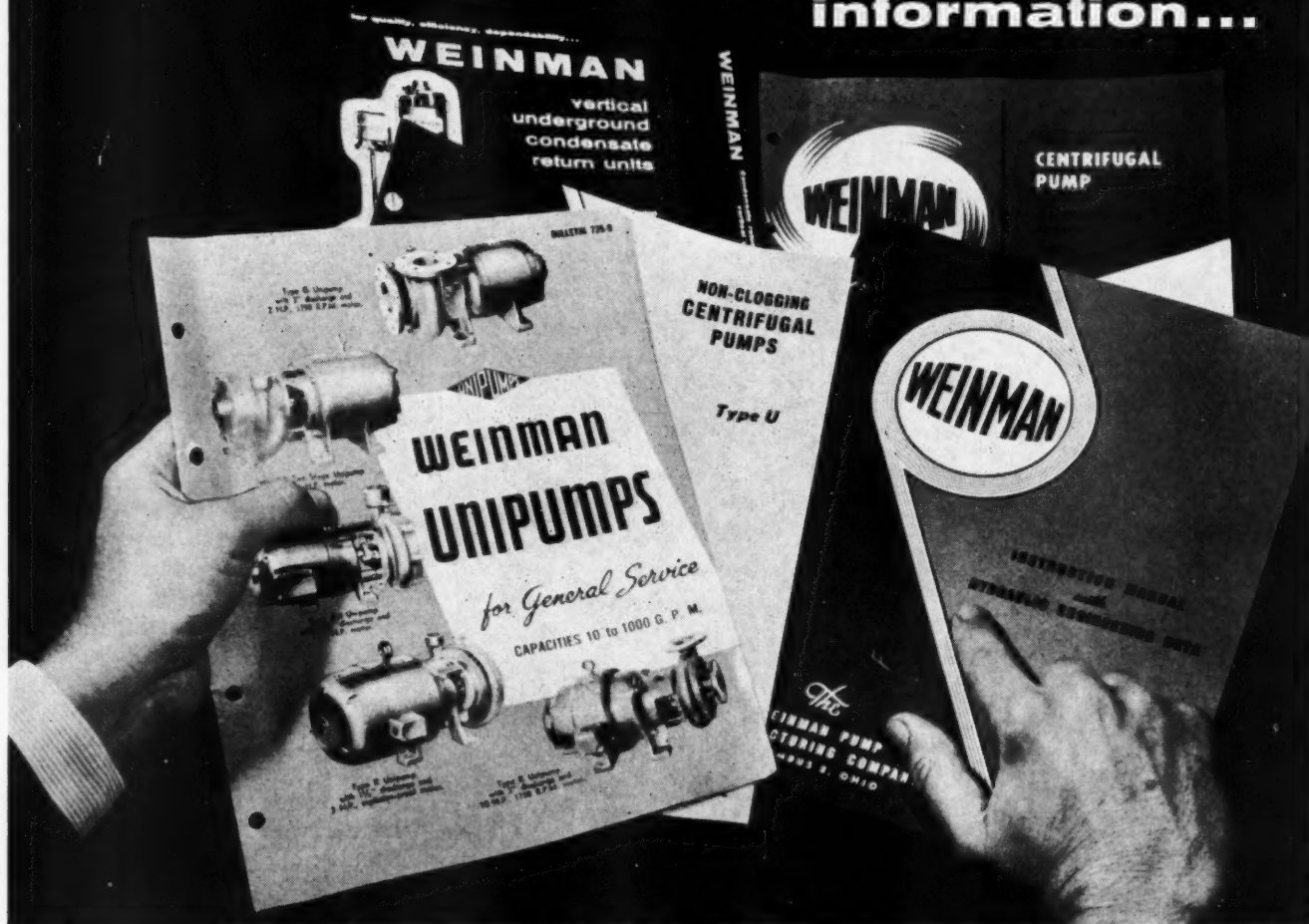
Many and varied answers were given here, but as might be expected, those who are not interested in joining thought their local association was of little value. The exception to this was where their reason for not belonging was because of membership through another partner in their firm. Of those who would like to join their local association, most thought the group was very effective in one or more of its activities.

Another interesting fact comes out in comparing the total number of answers to Part II and to Part III. Part II was answered by members of local associations of consulting engineers, Part III by non-members who lived in an association area. There were almost the same total number of returns answering each section. This would indicate that those local associations now in existence have only about half their potential membership.

Part IV

This part of the survey was answered by consulting engineers in

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areas where there is not currently an association of consulting engineers. The fact is that there are only 11 functioning associations of consulting engineers in the United States. However, most of these associations are in heavily populated areas, and therefore do cover many of the country's consulting engineers. A study of the returns for the survey as a whole indicates that currently there are about twice as many consulting engineers in areas where there are not associations as there are in areas where associations do exist.

1. *Do you know of any effort being made to start an association of consulting engineers in your city, state or region?*

Yes 11.9%

No 88.1%

The states in which answers indicated that consulting engineer associations are being organized are Ohio, Illinois, Iowa, North Dakota, Pennsylvania, Kansas, Connecticut, Oregon, Michigan, Massachusetts, Washington, D. C., Indiana, South Carolina, and Alabama. Ohio was the only one of these states that had a large number of returns answering "Yes" to this question. It is quite likely that these answers had reference to the Functional Group of the Ohio Society of Professional Engineers. So few of the returns from other states indicated any knowledge of an organization being started that in some instances the proposed association may be little more than a thoughtful gleam in some one consultant's eye.

2. *Would you be interested in assisting in the formation of such an organization?*

Yes 61.6%

No 38.4%

This is an interesting answer. More than 60 percent of the consultants in areas where there currently is no association of consulting engineers would be interested in assisting in the formation of such an organization. In fact, some of these states seem to be ready to start full-blown associations if someone just stands up and shouts. For example, Kansas, Pennsylvania, Massachusetts, and Maryland could have a sizeable organization by assembling those who said in this survey that they would like to assist in the formation of a local association. There is no question

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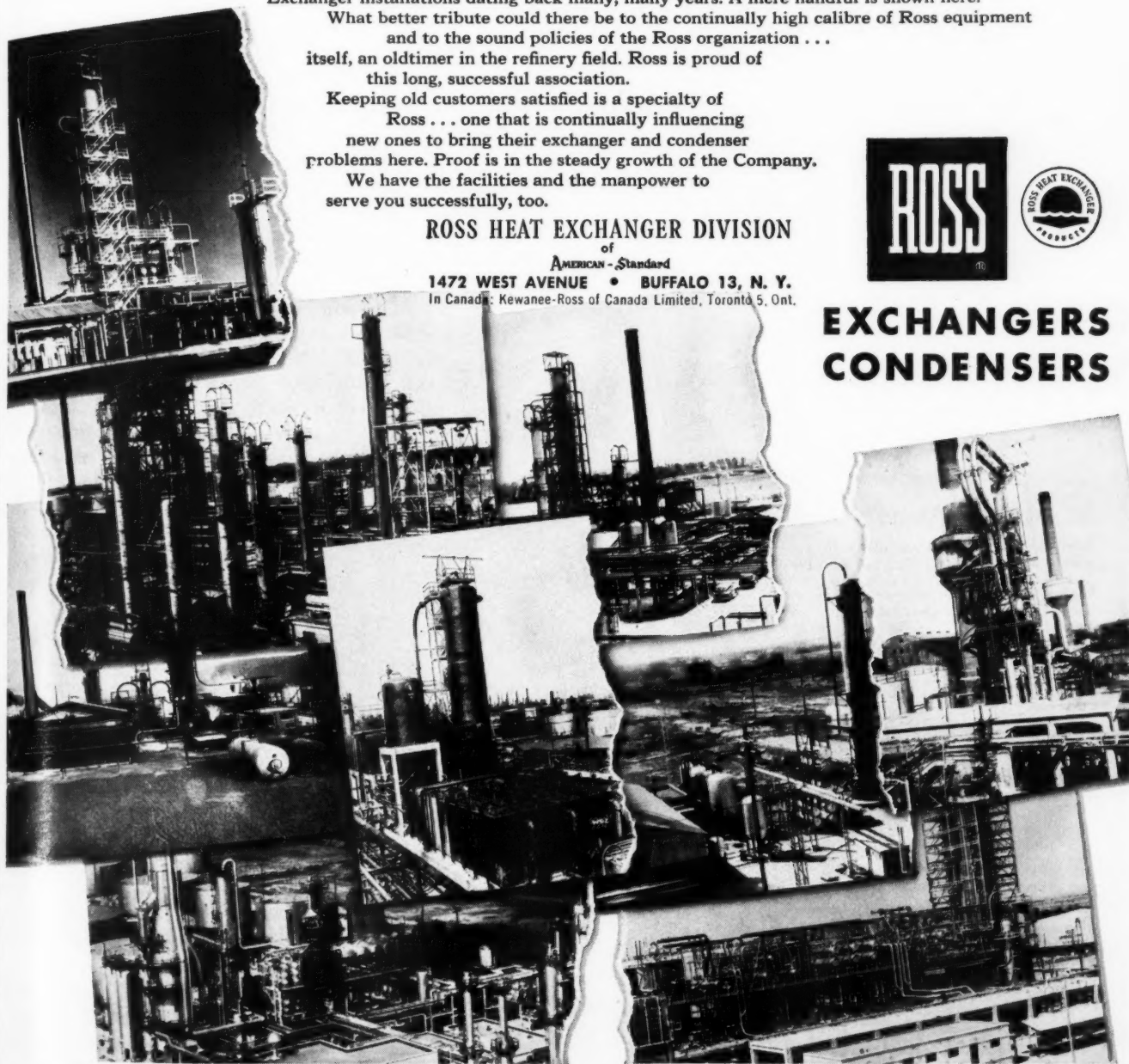
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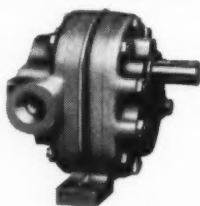
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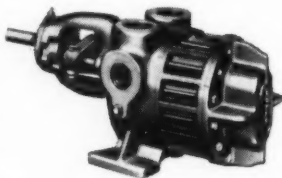
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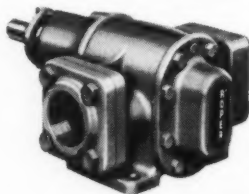
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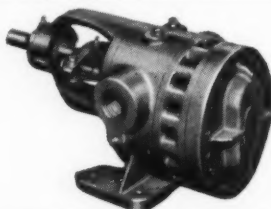
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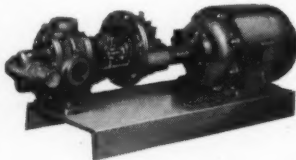
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but that there are many consultants in every part of the country who are willing — even anxious — to help form state or regional associations in their own localities.

3. *Could you estimate how many consulting engineers in your state would be interested in joining such an organization?*

The answers to this question varied considerably, and the great majority did not attempt an exact figure. Those who did indicated that from a low of 6 to a high of 500 consulting engineers in their various areas might be interested in joining a consulting engineers' association. Most of those who made a firm estimate felt that between 25 and 100 prospective members could be found in their locality.

4. *If such an association were formed do you think it should be affiliated with the other state associations in a national group?*

Yes 89.0%

No 11.0%

There is not much question but that the consultants now living in areas where there are no consulting engineer associations feel that any local association formed should affiliate itself with a national group. The idea of having the local groups brought together in one national federation is attractive to about 9 out of 10 of the consultants answering this part of the survey. There can be no doubt, based on the survey as a whole, that a national federation would add considerably to the attractiveness of local associations — both those actually in existence and those contemplated.

5. *What do you think should be the principal activities of these associations of consulting engineers?*

By far the most popular of the activities listed was "Ethical Practices." Next came "Engineer-Client Relations." The publishing of fee schedules was also considered very important. Tailing the list was "Social." Apparently, consulting engineers are not looking for a luncheon club but for a working association dealing with their particular problems.

6. *What is your opinion of the usefulness of your State Professional Engineers in representing consulting engineers' interest?*

While the answers to this ques-

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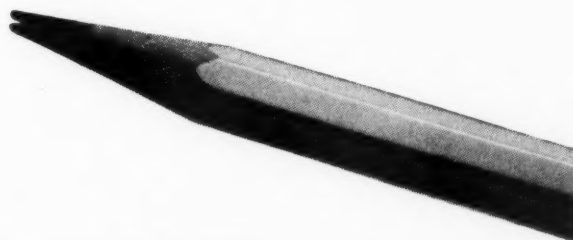
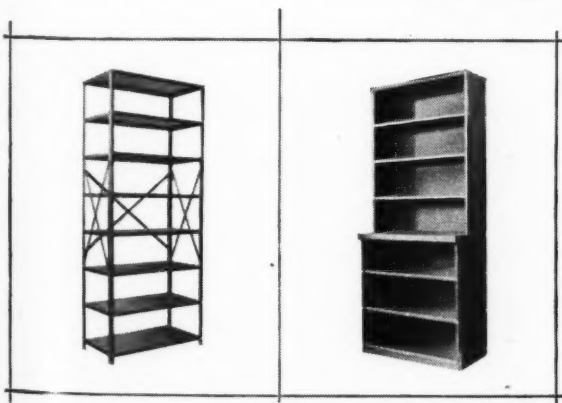
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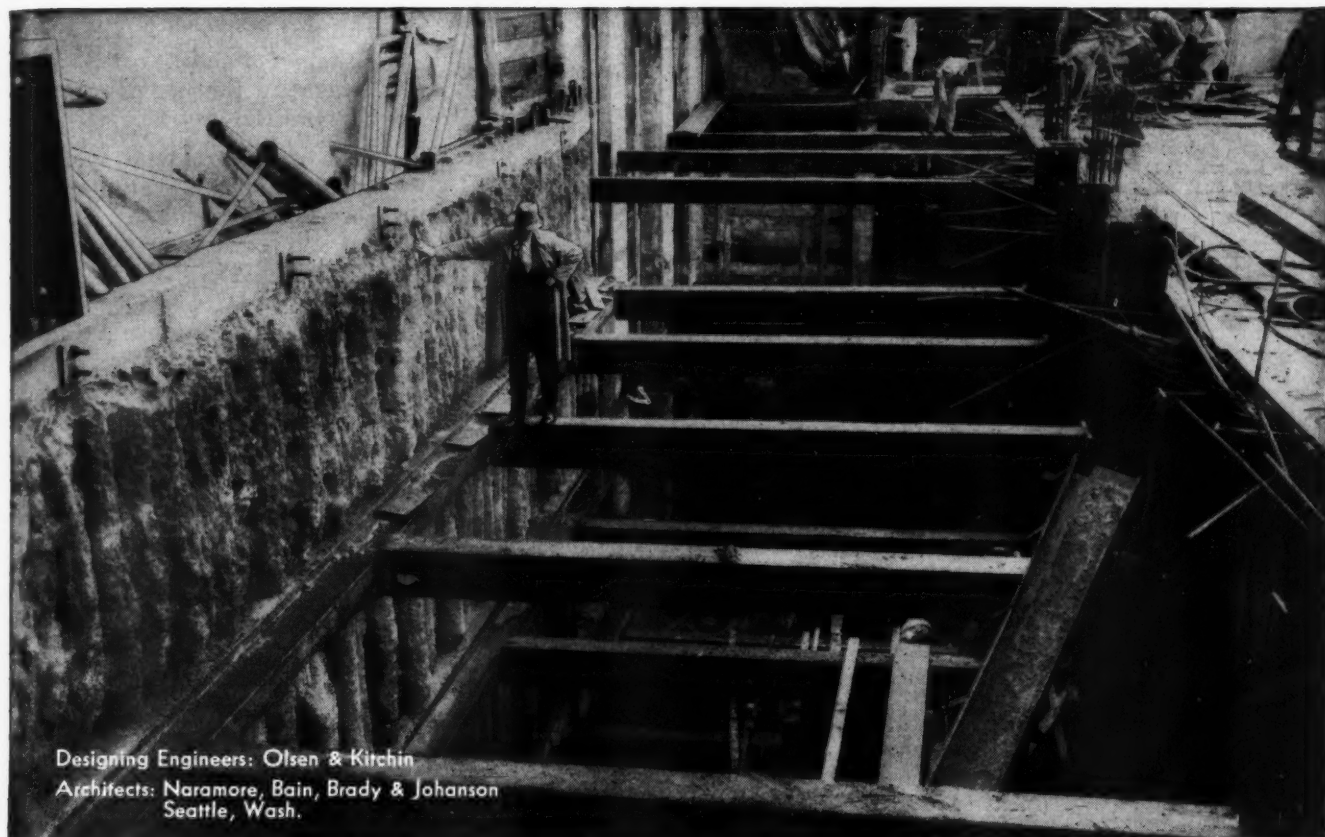
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tion are most interesting, they cannot be expressed in percentage figures. It must be remembered that this question does not ask what is thought of the State Societies of Professional Engineers, but what is thought of those Societies insofar as they represent the interests of consulting engineers. Apparently, many consulting engineers regard the State Societies of Professional Engineers and the NSPE very highly, for it will be remembered that the answers to Part I indicate that more than half of the consultants are members of NSPE. Since the answers to this question all stated varying degrees of opinion, it is impossible to place them in absolutely accurate categories. However, it is generally accurate to say that 24 percent had no opinion, 34 percent thought their State Society of Professional Engineers was doing a fair to excellent job, while 42 percent felt the State Society was doing a poor to terrible job in representing consulting engineers.

It is no surprise that there is a great variance of opinion as to the value of the State Societies of Professional Engineers in representing consultants. The surprising thing to come from this survey is how effective the State Societies are in some areas in comparison with others. Again, the Ohio Society of Professional Engineers, which is already working in Functional Groups, seems to be doing a most excellent job for the consultants. A very great majority of the consultants in Ohio feel strongly that the Ohio Society is representing them adequately to excellently. The same is true in Houston, Texas, and in Kansas City, Mo. These three spots stand out as areas in which the State Societies are satisfying the needs of consultants in an excellent manner.

The great majority of the consulting engineers who felt that the State Societies were of little use or worthless based their opinion upon the fact that these societies are made up primarily of employees in industry and therefore have no interest in consultants.

It would appear that the State Societies of Professional Engineers in some ways resemble the little girl with the curl in the middle of her forehead. ▲ ▲



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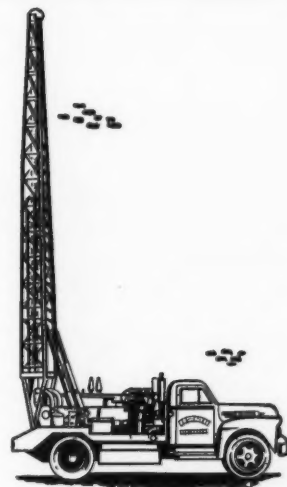
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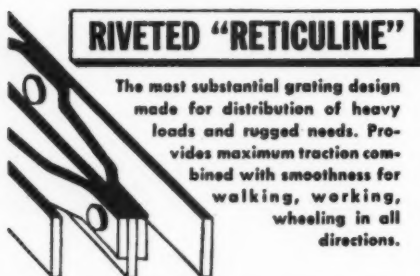
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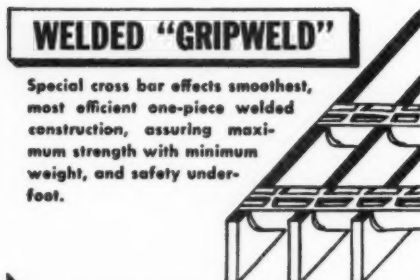
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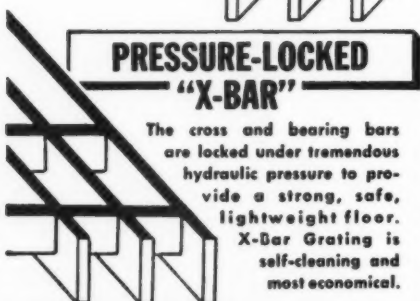
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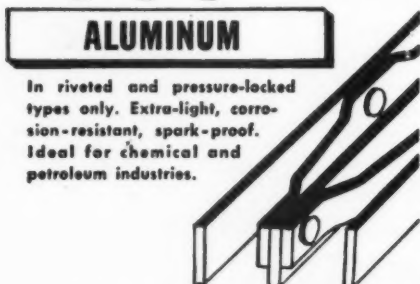
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Report From Abroad

—Starts on page 30

presently being handled by these major foreign manufacturers.

Another trend that needs careful scrutiny is the tendency of consulting engineers in Europe to group their organizations and pool their facilities in order to be able to effectively compete for large development programs presently underway in many of the underdeveloped countries. The Dutch have been particularly successful with their NEDECO (Netherlands Engineering Consultants) in bidding and winning a number of important irrigation, waterway, community, power, and similar development projects in underdeveloped areas. The Norwegians have NORENO (Norwegian Export Organization) which has been in existence longer than the Dutch NEDECO but has not had nearly the same success—possibly because it is not a true independent consulting firm but is tied in with commercial interests. The Germans have recently formed a group (similar to NEDECO) of 12 independent professional consultants and have been accredited by the World Bank. The Belgians and the French have comparable organizations.

These groupings of consulting firms specifically interested in foreign work have proven advantages. The concept may suggest possibilities to American consulting firms that also contemplate bidding for foreign development projects yet are handicapped by limited capital and staff. A grouping of American consulting firms interested in foreign work could be an effective solution.

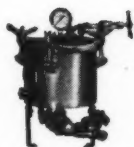
American consultants can go a long way towards stimulating cooperation and exchange of information with European consultants. However, any real effort to further the professional interests of consulting engineers will probably have to await the formation of an organization in the U. S. that will actually represent the interests of a majority of American consulting engineers. When and if such an organization comes into existence, it will unquestionably qualify for membership in the In-

ternational Federation of Consulting Engineers and be able to add its weight in the professional activities of FIDIC.

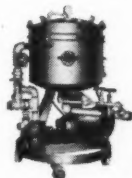
Most of the problems that face FIDIC are also of direct interest to the American consultant. The National Associations of Consulting Engineers in Europe have established fee schedules more or less based on the same format (a percentage of the total construction cost). These fee schedules are strictly enforced and have almost eliminated disputes arising out of unethical practices such as fee-cutting or competitive bidding. What remains to plague the European consultant who is a member of his National Association and abides by the fee schedule are those consultants who work outside of the Association and who feel free to cut their fees. The solution here will probably come by educating the clients to the dangers inherent in fee-cutting practices (inferior designs), by bringing the outside consultants into the Associations, and as a last measure by using pressure (revoking a license) against consultants resorting to unethical practices.

On the question of advertising, the Associations and Federation are still debating the merits of collective advertising. It seems almost certain that something will be done to tell potential clients, especially those in underdeveloped countries, about the functions and importance of consulting engineers and explain their relation to manufacturers and contractors.

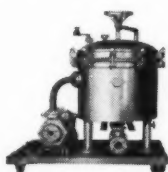
The Federation itself is concerned with the relationship of its consulting engineer membership with the contractors' federations, government bodies, and other interests who come into contact with consultants. If the U. S. could participate in these affairs it would add tremendous prestige and importance to the negotiations. And since the results would directly assist in giving the professional consulting engineer greater recognition, more opportunities in the world market, and better working relations with contractors and manufacturers, it is essential that the U. S. consultants play the role to which their important position entitles them. ▲ ▲



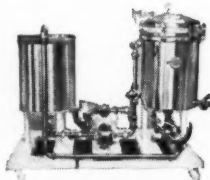
Laboratory filter.



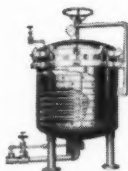
Varnish and lacquer filter.



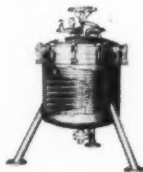
Plating solution filter (portable).



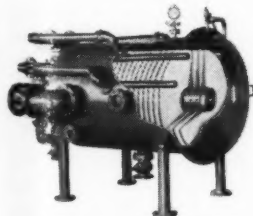
All stainless steel filter with stainless steel piping, valves, and slurry tank.



Standard horizontal plate filter.



Beer polishing filter.



Large volume water filter, Model SCJ. Single unit capacity up to 5,000,000 gal. per day.

Sparkler Filtration Engineering

...the key point of quality for many products

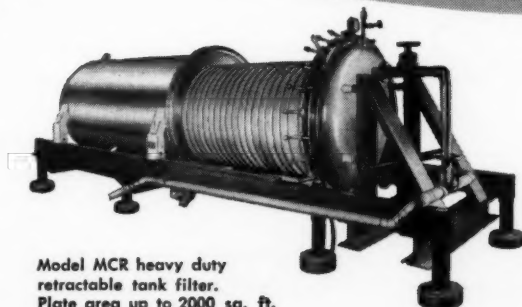
At Sparkler, engineering special adaptations of standard filters to meet particular requirements of a product is a continuous daily occurrence. Engineers working on plant layouts and production line processes can get willing cooperation and the benefit of experience in solving similar problems from Sparkler.

By concentrating on filtration engineering and manufacturing exclusively over the past 30 years Sparkler has been successful in improving filtration processes through sound engineering and with the development of hundreds of special filters particularly adapted to the requirements of food products, chemicals, pharmaceuticals, petroleum and derivatives, beer, whisky, sugar refining, electroplating and many other products as well as large volume water filtration for municipal and industrial use.

SPARKLER MANUFACTURING CO., MUNDELEIN, ILL. • PHONE MUNDELEIN 6-6430

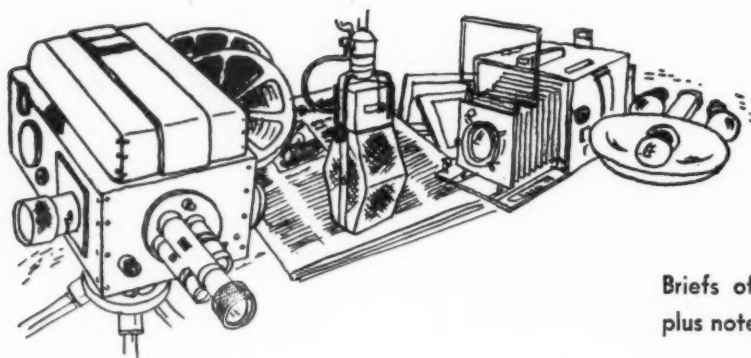
Sparkler International Ltd. with plants in Canada, Holland, Italy, Australia.
Service representatives in principal cities throughout the world.

SPARKLER FILTERS



Model MCR heavy duty retractable tank filter.
Plate area up to 2000 sq. ft.

Built to ASME specifications when required.



NEWS

Briefs of current interest to the consulting profession plus notes on new equipment in the field of engineering

Building Planning Service Aids Engineers, Architects, and Owners

The success or failure of a large office building can depend upon the investment made for each net rentable square foot of office space — the unit of income. It is important that this cost data be carefully studied before detailed plans are prepared as to column spacing and story heights, major factors in the economics of a commercial building.

One of the activities of the National Association of Building Owners and Managers, representative of local associations of building managers in principal U.S. and Canadian cities, is the Building Planning Service. Conceived by Earle Shultz, retired manager of the Commonwealth Edison office buildings, the service is designed to provide an owner and his consulting engineer with an evaluation of the ultimate economics of a proposed building.

Until 1924 there was no generally accepted data relating to the economic design of an office building. By 1942 the economics of design had been substantially determined but coincident with the development of air-conditioning and fluorescent lighting the concept of design changed. The economics of column spacing are being determined today more by the modular theory than on the theory of efficient subdivision as was formerly the case.

When an assignment is received by the National office the personnel proposed to make up the consulting group is discussed with the client and a selection made from participating engineers, operators, and renters of office buildings from across the country. The National office prepares a statement of the objective from the standpoint of the owner with a conception of the project by the architect. This information, with floor plans, is forwarded to each committee member. After a two-day meeting, the committee submits a summary of recommendations with respect to the contemplated development.

The chairman of the committee works from a prepared outline covering all features of the building — exterior materials, types of windows, types of floor slabs, elevators, interior finishing, air-conditioning, light intensity, and facilities for economic operation. Consideration is given to the economic maximum and minimum size of the project

and the economics of the typical floor layout. According to George R. Bailey, national chairman of the Building Planning Service, often the thinking of the committee of six or seven men has resulted in a completely new conception of the project.

Originally designed to recommend with respect to layout, design, and specification, the Service now includes information on alternate sites, possible purchases on the part of large tenants, and modernization of old structures. The client pays a fee to the National office which in turn pays each member of the committee a modest per diem fee.

Since its first assignment in 1924 on the Straus Building in Chicago, the Service has handled over 200 projects. Recent assignments include: the proposed Seagram Building in New York City; the Imperial Oil and Bank of Nova Scotia Building in Toronto, Canada; the Southland Life Building in Dallas; and the Second National Bank Building of Houston, Texas.

National Building Code Revised

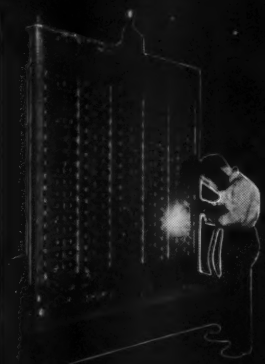
The National Board of Fire Underwriters has completely revised its Recommended National Building Code to provide answers to current building design problems. It answers such questions as:

When is it proper to use glass and other light noncombustible panel walls in building exteriors?

How should exceptionally large industrial buildings be constructed for reasonable fire safety?

For exterior building walls, the code makes their required fire resistance dependent on the amount of permanent open space between them and the nearest line to which a building is built or may legally be built. For exterior walls on a property line, a fire resistance of three hours is required and the total area of windows in such walls is restricted. As the distance from the lot line is increased, the fire resistance requirement is lessened and the amount of permitted window area increased until a separation distance of 30 ft is reached. At this distance, with certain exceptions, the walls may be without fire resistance rating, thus permitting use of glass or other noncombustible material.

For industrial buildings of exceptionally large



WELDING SOLVES ANOTHER WEIGHT PROBLEM

(and USS "T-1" Steel solves the welding problem!)

Bedplates for modern color-printing presses have to be rugged—but as lightweight as possible. They must withstand constant pounding from printing rollers and cutting knives. And, since they move back and forth continually, they've got to be lightweight for fast, efficient operation. It is a good place to use a welded assembly of steel plate.

But that's where Graver Tank & Manufacturing Co., Inc., ran head-on into a tough fabrication problem. Alloy steel with the necessary strength and durability was difficult to weld. And with 534 welds to make on *every* bedplate, this was a king-size headache.

NO MORE HEADACHE!

Now the headache is gone. Production costs are down. And the finished bedplates are working hard and long . . . taking a tremendous daily pounding without distortion.

The solution? Just a switch to a remarkable *new* alloy steel, USS "T-1" Steel.

"'T-1' Steel is very strong. Very tough. Able to take vicious impact abuse. Yet, it's easy to weld," says Mr. H. McDonald, Superintendent at Graver.

HOW ABOUT YOU?

If you have tough jobs, rugged jobs, where you want to weld your way to lower costs, give this new steel a try. We think you, like Mr. McDonald, will find it the best thing you have ever used. Right now, "T-1" is in service and doing well in bridges, power shovels, steam turbines, electrical transformer tanks, flywheels, pressure vessels, mine cars, and lots of other places. Write for details. United States Steel, Room 5080, Pittsburgh 30, Pa.

"TOP QUALITY" That's how Graver Tank & Manufacturing Co., Inc., East Chicago, Indiana, describes new USS "T-1" Steel. It gives them a yield strength of 90,000 psi . . . exceptional resistance to impact abuse . . . and good weldability. It enables them to build extremely rugged, all-welded bedplates for printing presses.



UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **"T-1"** CONSTRUCTIONAL ALLOY STEEL



6-15

UNITED STATES STEEL

area, a separation of at least 80 ft is required from lot lines, and construction is limited to materials rated noncombustible. Sprinklers are required except for an occupancy that uses nothing but noncombustible materials.

Another problem of special interest in many parts of the country, and one on which the code gives newly-revised and expanded information, is how to construct buildings so as to minimize wind-storm damage. This is handled by an appendix giving detailed suggestions on roof anchorage, attachment of coverings, and other features of design.

Still another problem of wide current interest is how to use plastics properly in building construction. The new code, in making provisions for their use—with special provisions covering use in windows and skylights, and light-diffusing ceilings—relates their use to basic requirements of combustibility and flame-spread characteristics as applied to other building materials and takes advantage of special conditions in which plastics may be used with little fire hazard.

The new code also allows larger areas in proportion to the number of automatic sprinklers than have been recommended in previous editions of the code or in other building codes. These larger areas for sprinklered buildings were arrived at on the basis of underwriters' experience in evaluating the worth of automatic sprinkler systems.

Emphasis is placed on the fact that the National Building Code is a performance code and insofar as practicable, within the limits of public safety, allows for the use of any material, type of assembly, method of construction, or style of architecture that meets the required standards of strength, stability, and fire resistance.

Working Models of Switchgear On Display by Allis-Chalmers

An opportunity for consulting engineers to acquaint themselves at first hand with all the components that go into modern switchgear is being made available through a series of demonstrations being conducted in various cities by Allis-Chalmers Manufacturing Co.

Almost every component or sub-assembly used in outdoor or indoor switchgear is displayed in such a way that parts can be examined freely, and in some instances, operated. Complete 4.16 and 13.8-kv magnetic air breakers are displayed with covers, arc chutes, and shielding removed from the main contacts and auxiliary equipment. Components too large to move readily, such as full size metal cubicles, are shown as detailed models.

Parts and models of 4.16 and 13.8-kv metal-clad switchgear shown include circuit breakers, emergency power closing devices for circuit breakers, and potential transformer carriage assemblies with PT's, current limiting fuses, and disconnecting devices.

The new 600-v air circuit breakers and component parts of the new design 600-v metal-enclosed

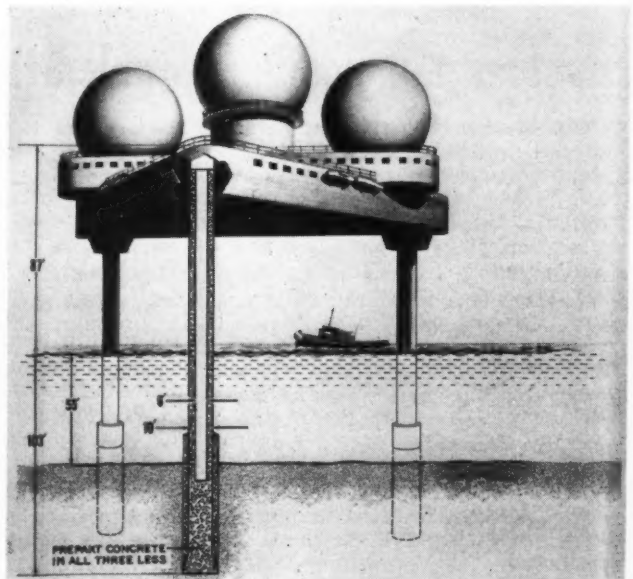
switchgear units also are being demonstrated.

The various displays are explained to small groups of invited guests by switchgear department and district office representatives.

Radar Island Rests on Concrete Legs

The Nation's first "radar island," in shoal waters of the Atlantic Ocean some 110 miles east of Cape Cod, presented difficult design and construction problems. (This is the island on which Defense Department officials were marooned for three days when a storm broke during an inspection tour.)

The structure on which the radar equipment rests is a 6000-ton platform supported by three specially designed legs. Twelve temporary caissons held the



THREE STEEL LEGS STRENGTHENED AND SEALED
WITH CONCRETE SUPPORT 6000 TON PLATFORM.

platform above the water while the three, 10-ft diameter, permanent caissons were lowered to the bottom. The lower 14 ft of the caisson cutting edges had been filled with Prepakt concrete before being shipped to the job. After lowering, the remainder of each cutting edge was concreted and the permanent caissons sunk to a total depth of 103 ft. The concrete was made in the caissons by preplacing course aggregate, and then consolidating the rock with Intrusion mortar.

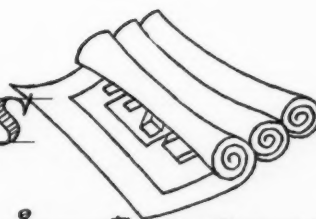
Since less than 40 percent of the total concrete volume—the Intrusion mortar—passed through the mixing plant, a smaller plant could be used.

After the caissons had been filled to a total of 56 ft, the inner 6-ft diameter steel shell was inserted and the two-ft annular space concreted.

Engineers on the project were Moran, Proctor, Mueser & Rutledge and Anderson-Nichols & Co., a joint venture. Intrusion-Prepakt, Inc. supplied the concrete and assisted in placement. ▲▲

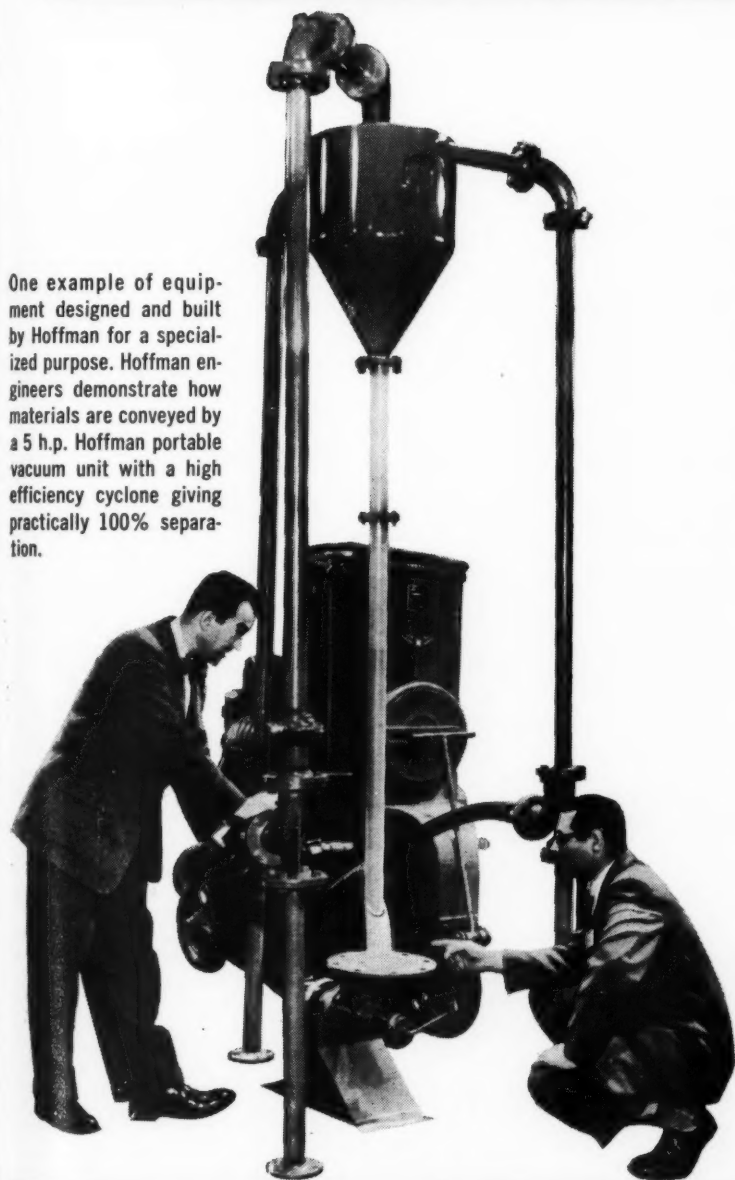
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*designed to do
the tough jobs in industry*



**FOR DRY MATERIAL CONVEYING SYSTEMS—
COUNT ON SPECIALIZED ASSISTANCE FROM HOFFMAN**

One example of equipment designed and built by Hoffman for a specialized purpose. Hoffman engineers demonstrate how materials are conveyed by a 5 h.p. Hoffman portable vacuum unit with a high efficiency cyclone giving practically 100% separation.



When your projects involve plant collection of coal, sand, ash, dirt, grit or other dry materials for reclamation or disposal, count on Hoffman for the right vacuum cleaning equipment, backed by long, unmatched experience in industrial air application. Whether you are engaged on a standard installation or on a uniquely designed system, Hoffman can help you simplify and accelerate the completed operation.

Since planning a vacuum installation inevitably takes into account such considerations as the type and quantity of material, the rate and distance of conveying, the degree of separation required and hazards associated with the material, you will be seeking reliable data on these and similar problems. Hoffman air appliance engineers can supply such data, based on thousands of installations in virtually every type of industrial plant, yet selected with care to meet the needs of any specific installation. Hoffman engineers look forward to cooperating with you at every stage in your next project.

Write for free treatise: "Design Factors in Vacuum Cleaning."



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*Multistage Centrifugal Blowers
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Conditioners, Filters, and Vaporizers
Solvent Recovery Systems—
Vacuum Stills and Filters*

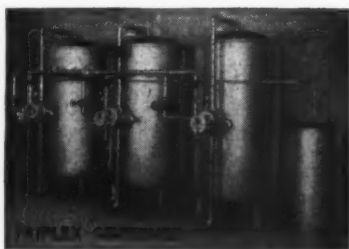
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Stationary and Portable Vacuum
Cleaning Equipment
Process Equipment
Pneumatic Systems for Radioactive
Materials*

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ionXchange

SOFT WATER FOR BOILERS



**...A PLACE YOU CAN USE
EXPERIENCED ADVICE**

The familiar process of softening "hard" water for make-up in low pressure boilers has undergone some interesting changes in recent years. In the first place, with the rapid development of ionXchange processes, several groups of completely-new resins have become available — to make water-softening more complete, more efficient, and more economical. In the second place, there are now several different "softening" processes available, each producing different dissolved compounds in the effluent, and each having its particular purposes and applications.

**WE WERE AMONG THE FIRST
TO DEVELOP ION-EXCHANGERS**

Finally, the mechanical design of the systems has undergone important changes, with the great increases in resin capacities and the various new materials now in use. Our experience with ionXchange starts with the year that practical resins were first introduced, and covers a wide variety of successful installations. *This experience is available to you to help improve your water-softening operations. Just drop a line to...*

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ionXchange

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NEW YORK OFFICE: 141 E. 44TH ST., NEW YORK 17, N. Y.
CANADIAN DIST. PUMPS & SOFTENERS, LTD. LONDON, ONT.



MEN IN ENGINEERING

Arthur D. Little, Inc. has opened a branch office in Washington, D.C., in Suite 606, the Carfritz Building, 1625 Eye St., N.W. It is staffed by C. Lincoln Jewett and Jerry Wallace.

Ebasco Services, Inc. has been engaged to supervise all necessary services for the engineering, design, and construction of a new \$27 million pulp and paper mill to be erected for the Container Corporation of America at Brewton, Ala. A. P. Schnyder is Ebasco's project manager.

The government of Brazil has conferred the Marechal Caetano de Faria Medal to Dr. D. B. Steinman in recognition of his professional achievements and engineering contributions to the Republic of Brazil.

The American Institute of Chemical Engineers have awarded the William H. Walker Award to Edgar L. Piret, Professor of Chemical Engineering at the University of Minnesota. Robert Lamar Pigford, chairman of the Department of Chemical Engineering at the University of Delaware received the Professional

Progress Award in Chemical Engineering, sponsored by Celanese Corporation of America, and administered by AIChE.

Edwin Lee White, retired chief, Safety and Special Radio Services Bureau, FCC, has joined the firm of Microwave Services, Inc., communications consulting engineers, as senior consultant.

Drake, Startzman, Sheahan and Barclay has appointed Burr W. Hupp, A. L. Lowe, and Richard J. Sweeney to the new position of associate in the firm.

Dr. Lee A. DuBridge, president of Cal Tech, has been elected chairman of the Board of Trustees of the Air Pollution Foundation.

In conjunction with its Centennial celebration, the University of Pennsylvania cited 23 alumni of its engineering schools for professional achievement, contributions to the public welfare, and service to their alma mater. Consulting engineers so honored were Thomas E. Bruder,



**GERMAN TEAM
VISITS KIDDE**

German layout and construction team studies scale model of Johnson & Johnson plant at Walter Kidde Constructors, Inc. L. to R., E. Warren Bowden, Kidde vp; Kurt A. Koppenhofer, architect, Büro für Industriebau, Stuttgart; Curt E. H. Siegel, prof. of structural engineering, Kultministerium, Baden/Württemberg; and Frank Whitney, Kidde chief engr.

CONSULTING ENGINEER

Scandinavia increases steam capacity, cuts costs burning coal the modern way

With its old power equipment overloaded by an ever-increasing demand for steam, Scandinavia Belting Co., Charlotte, N.C., took stock of its power situation. Boiler room efficiency was low and maintenance excessive; pressure fluctuated and labor costs had become a problem. Deciding to modernize, Scandinavia instituted a survey of all available fuels. On the basis of cost, coal was chosen. Today, after modernization, Scandinavia's power plant has increased steam capacity 150%, reduced fuel costs 15% and cut labor costs 70%. Increased efficiency and automatic operation have reduced the work force and assured a dependable steam supply at steady pressure with ample reserve for load growth. In addition, the cleanliness of the new plant has been an important factor in raising the morale of the employees.

Note to consulting engineers:

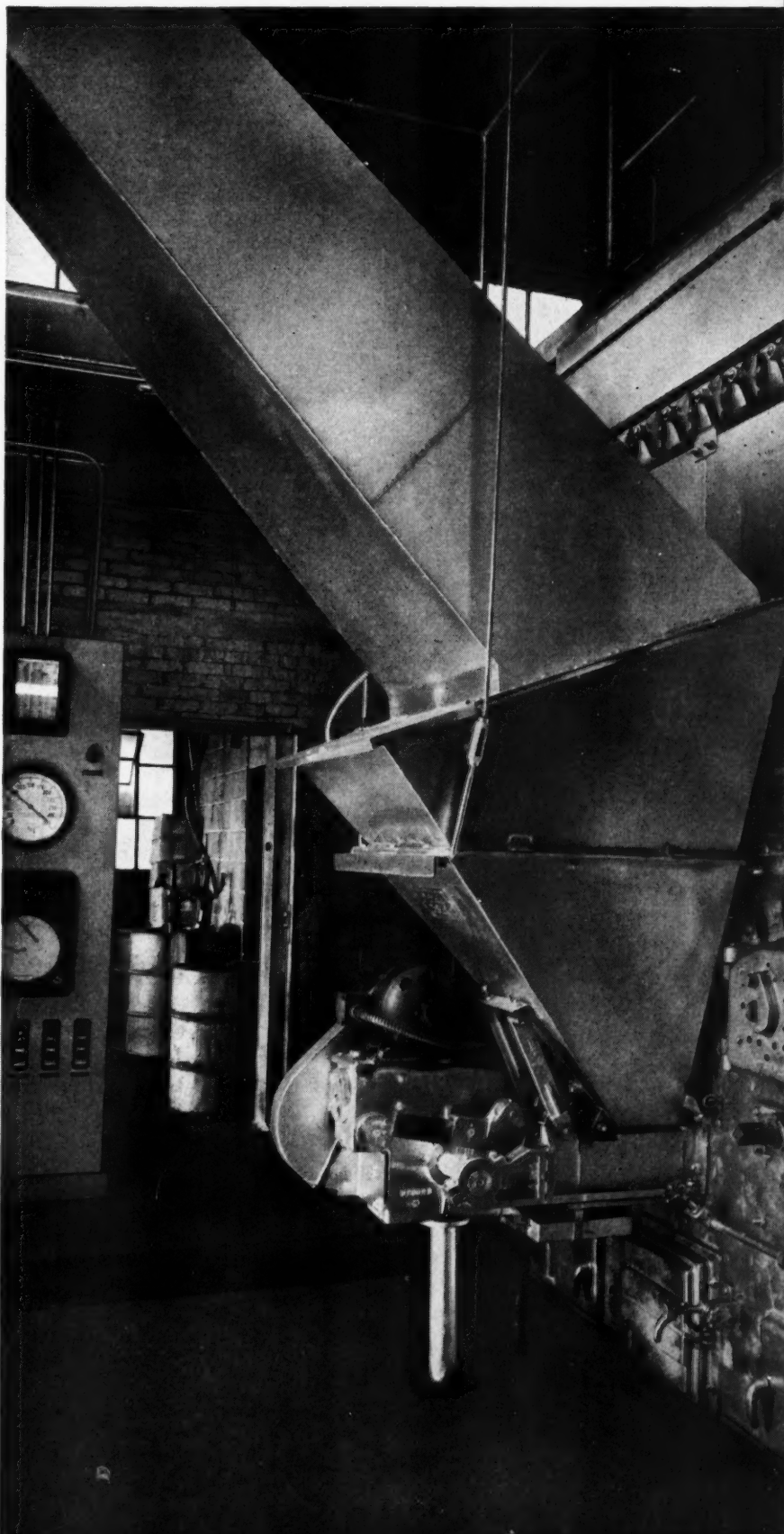
Many companies planning a new power plant, or the remodeling of a present one, consult an engineering firm on its design and construction. When you have such a project, our Engineering Department will be glad to assist you in your fuel cost survey with any coal information you may require. In most cases, for the reasons listed below, the use of coal results in substantial savings by increased efficiency and fuel economy through the years.

facts you should know about coal

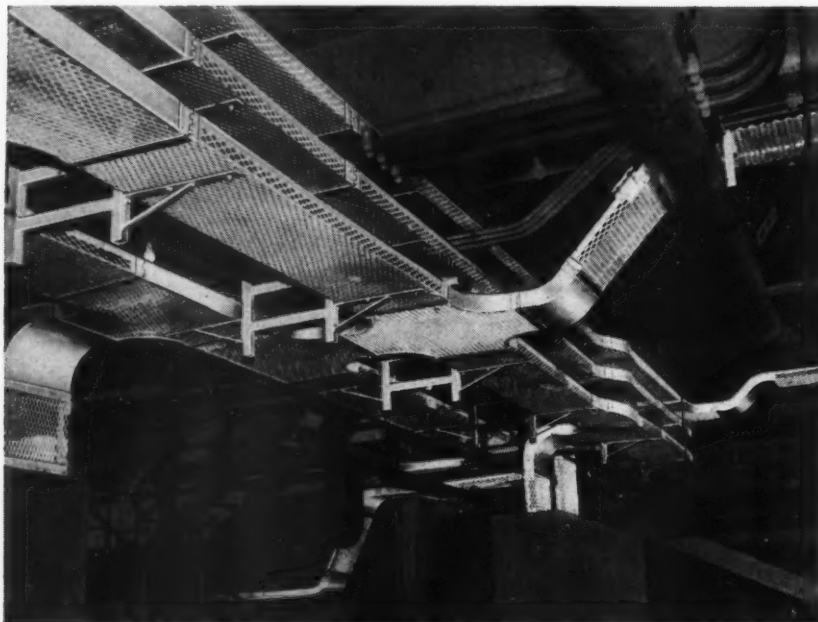
In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum • Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D.C.



P. G. & E. Uses Cope Cable Trough

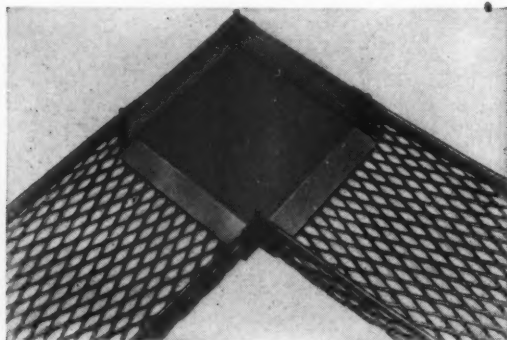


Humboldt Bay Steam Plant Pacific Gas & Electric Corporation
Engineers: Bechtel Corporation

Pacific Gas and Electric installed Cope cable trough for its latest installations in new generating stations. Efficient utilities everywhere are adopting Cope cable trough to eliminate costly and needless conduit.

Cope cable trough saves three ways:

- Materials are reduced by 75% on a lineal foot basis
- Installation costs are reduced because cable trough is so easy to install
- Operating costs are reduced because accessible cable is simple to inspect, repair or replace and additions are simply laid in existing trough.



New Cope 70,000
Series features unique
flexibility in elbows—
reduces the need for
standard fittings.

Our engineers are ready to work with you. Write
us today for full details on new 70,000 Series.

T. J. COPE, INC.

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GROUND TENTS



ROD GRAPPLES



CABLE REEL JACKS



WARNING SIGNS



CROSS ARM SHEAVES

Samuel Logan Kerr, Charles S. Leopold, and Henry N. Rodenbaugh, all of Philadelphia.

Otto F. Sieder has retired from the H. K. Ferguson Company. He was vice chairman of the Board.

John Hallett has been elected a vice president of Kaiser Engineers Division of Henry J. Kaiser Company. He will be located at the firm's headquarters in Oakland, Calif.

Tammen & Denison, Inc. has appointed Harvey S. Vincent as vice president in charge of sales.

Mario G. Salvadori has joined the office of Paul Weidlinger, Consulting Engineer, 101 Park Ave., New York, N.Y., as an associate.

Whitman, Requardt and Associates, Baltimore consulting engineers, have engineered a complete water treatment project for the Ashburton Filtration Plant in Baltimore.

James H. Howard, principal of the firm of James H. Howard & Associates celebrated the tenth anniversary of his entrance into the field of consulting engineering on December 1. Before September, 1953 the firm had been known as Howard & Johnson. Offices are now at 4101 San Jacinto St., Houston, Texas.

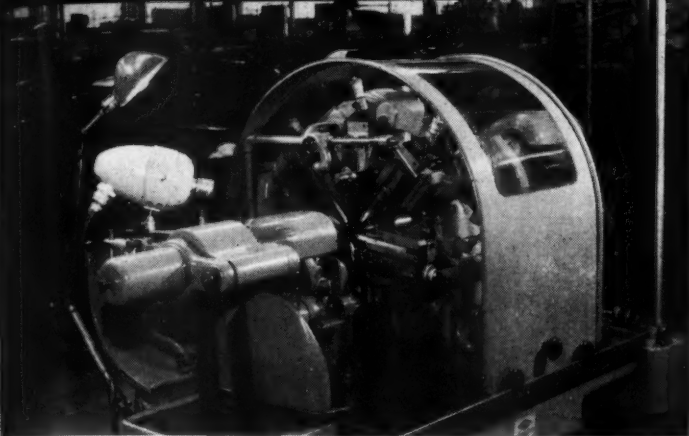
The new firm of Shock and Vibration Research, Inc. will be headed by Robert L. McKay as president. Before taking this post, Mr. McKay was a civilian scientist with the Department of the Army. Other members of the firm include Sidney H. Birdseye, Sr., Karl D. Swartzel, John H. Shields, John F. Brinster, Dr. Bruce D. Greenshields, and John H. Andrews. Offices are at 820 Hammond Building, Detroit 26.

Officers of the American Institute of Electrical Engineers for 1956 are: president, M. D. Hooven; treasurer, W. J. Barrett; secy., N. S. Hibshman.

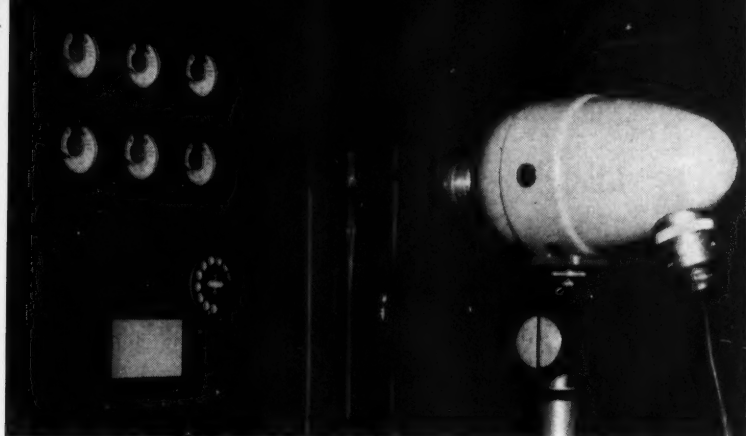
WANTED

ASSISTANT WORK MANAGER

To set up and supervise production lines and for general plant supervision. An experienced, capable engineer has a real future with this substantial, expanding firm of established reputation. Located in Southwestern city with unusual climatic advantages and recreational facilities. Resume will be held in strict confidence. Box A-1 Consulting Engineer, St. Joseph, Mich.



Watching machines is a job for the GPL TV camera. Above, the GPL camera mounted to face a screw-making machine instantly reports anything needing attention to the operator, increasing the number of machines he can tend efficiently.



In automation, whenever there are dials to be checked, the GPL TV camera can report to a central point. Motorized on rails or to swing around, the camera scans a whole bank of dials, sweeps an area. Equally useful in non-automatized production.



Danger is no problem. The GPL industrial TV camera can look into the face of danger and never blink. Above it reports to the operator a hazardous process taking place inside a test cell.



Wherever security control is a problem, strategically placed GPL TV cameras multiply the eyes of your guards. Here a single camera keeps watch over vital military equipment. Similarly, GPL TV cameras can guard the aisles of warehouses, restricted areas, exposed loading platforms.

Control Problems Solved by Seeing

GPL industrial television opens up new possibilities in control by providing instantaneous visual information on what's happening.

Good control is based on good information. And for many purposes no information can match seeing what is happening right on the spot. You can do just this, anywhere, anytime, with the industrial and institutional television equipment designed and made by General Precision Laboratory Incorporated, and known as GPL ii-TV.*

No spot is too far away, too dangerous, too cramped for GPL ii-TV. Unattended, the camera permits observers to see around corners, through walls, across thousands of miles, within the whirling heart of a machine. It can bring many scattered events to a single observer and, with GPL TV projectors, a single event to many scattered audiences.

With this new tool you can solve many kinds of control problems. You can use GPL industrial television to monitor remote machines. You can study a wing tip five miles up, or watch a grapnel grope along the ocean floor. You can follow and control a dangerous process, step by step, safe from fumes or radiation. You can control access to restricted areas, check signatures against a master file.

In fact, you can use GPL industrial television for anything that requires instant communication of visual information. You can improve skills and techniques of workers in scattered plants with visual demonstrations. You can run face-to-face conferences of far-flung personnel.

A GPL Industrial and Institutional Television System can do all these things for you—and many others—with high efficiency and low cost. Here's why:

* Trade-mark

- It is high-sensitivity, quality equipment. Behind it lies the long experience of General Precision Laboratory in building the finest in broadcast television. GPL equipment is used by 90 percent of all studios equipped for video recording; GPL cameras and controls are found in many of the finest broadcast TV installations.

- Military TV equipment must be really rugged—and GPL has been building it for years. Now GPL has designed your industrial TV system with high-strength elements and simple design that stand the gaff. Special housings protect the camera from weather, heat, shock, explosions.

- GPL's compact industrial camera is bullet-shaped to squeeze in almost anywhere. Only 2" larger in diameter than a baseball, it weighs 5 lbs. The 26-lb. control cabinet, the size of an overnight case, can be far from the camera.

- GPL's industrial camera is unique in its ability to obtain a good picture at very low light levels. With its Vidicon pick-up tube it can work under highly adverse conditions.

- GPL enables you to multiply your audience with a TV projection system for industrial use. It is made like the famed GPL theatre projectors used all over the country; mounted on rollers for complete mobility.

For more information on what GPL ii-TV can do for you—and suggestions on your special problems—write to:



GENERAL PRECISION LABORATORY INCORPORATED, Pleasantville, N. Y. (A subsidiary of General Precision Equipment Corporation.)

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22 Illustrated Pages
Tell You HOW and
WHY SPEEDLINE
FITTINGS

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- Simplify design and assembly
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Business Forecast For 1956

—Starts on page 34

off 1955 at what was probably an unsustainable rate.

It is not likely that the credit situation, which restricted residential building in recent months, will continue long this year. This easing, along with the reasonably-expected increase in lendable funds of insurance companies, savings and loan associations, and other investors, will provide sufficient financing for a satisfactory pick-up in residential activity as the year wears on.

An even more optimistic prospect can be advanced for the availability of financing of private nonresidential building. The lag between the imposition of tight credit and its effects on this category of building is considerably longer than for residential building. In view of the increasing attention being given to long-range planning and to the necessity of securing commitments well in advance of putting work in place, it is not likely that plans for nonresidential building this year will regard financing as a major problem.

Industrial Outlook

It is important to note here the increasing volume of funds being made available for industrial construction through retained earnings and depreciation allowances. A recent study by the Machinery and Allied Products Institute concludes that capital funds from internal sources over the next 10 years will run around 95 percent of the study's projected capital expenditure requirements on the basis of a high retained-earnings estimate. Even when a low estimate of retained earnings is used, a coverage of at least 90 percent is indicated.

State and local bond issues in 1955 were one of the few indicators of economic activity failing to register gains. From time to time last year there were reports of bond issues being postponed because of increased borrowing costs. Also, 75 percent of the bond proposals before voters last November were rejected. These might ordinarily be taken as signs of a forthcoming drop in construction outlays by state and local governments, but the need for highways, schools, and other components of public plant is so pressing that no one looks for reduced spending by these governmental units. It is indeed difficult to see how state and local outlays will ever get off the up-escalator.

There are several things that could thwart the realization of estimates of another increase in construction activity this year—a worse shortage of labor and materials, for instance. For the most part, however, there is general agreement that outlays for new construction will rise to still another record this year. It is pleasant to think that we might now be in dynamic economy in which a high level of construction activity is normal. ▲ ▲

consulting engineers' calendar

Date	Sponsor	Event	Location
Jan. 16	American Institute of Consulting Engineers	Annual Meeting	Engineers' Club New York, N. Y.
Jan. 18	Illinois Institute of Technology and Armour Research Foundation	Lecture on "Engineering Ap- plications of the Electronic Computer"	IIT Campus Chicago, Ill.
Jan. 23-25	American Society of Heating and Air-Conditioning Engineers	62nd Annual Meeting	Sheraton-Gibson Hotel Cincinnati, Ohio
Jan. 23-27	American Standards Association	Gaillard Seminar on Industrial Standards	New York, N. Y.
Jan. 24-27	American Management Association	General Management Confer- ence	Fairmont Hotel San Francisco, Cal.
Feb. 16	Illinois Institute of Technology and American Society of Civil Engineers	Lecture on "A Review of Fundamentals and Recent Work in Shell Theory"	IIT Campus Chicago, Ill.
Feb. 20-23	American Concrete Institute	52nd Annual Convention	Bellevue-Stratford Hotel Philadelphia, Pa.
Feb. 26-29	American Institute of Chemical Engineers	Meeting	Statler Hotel Los Angeles, Calif.
Feb. 27-29	American Management Association	2nd Annual Electronics Con- ference	Hotel Commodore New York, N. Y.
March 19-23	American Society of Tool Engineers	Annual Meeting and Exposition	International Amphitheatre Chicago, Ill.
March 21	Illinois Institute of Technology and American Society of Mechanical Engineers	Lecture on "Vibration"	IIT Campus Chicago, Ill.
March 21-23	Illinois Institute of Technology and Armour Research Foundation	18th Annual American Power Conference	Hotel Sherman Chicago, Ill.
April 8-20	Illinois Institute of Technology and Armour Research Foundation	National Research Industrial Conference	Chicago, Ill.
April 9-12	American Management Association	Silver Anniversary National Packaging Exposition	Convention Hall Atlantic City, N. J.

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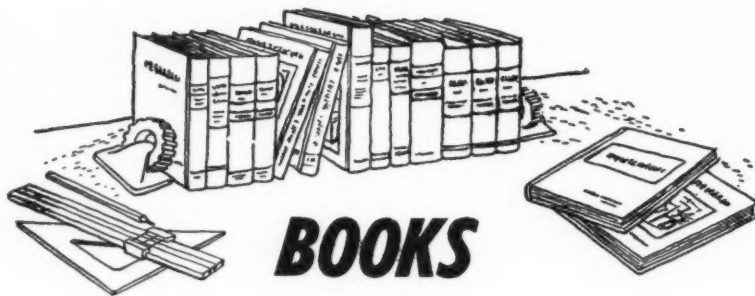
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THERMODYNAMICS REFRESHER, new first edition by John D. Constance; paper bound; \$3.25.

*Reviewed by Dr. Abraham Slavin
Consulting Engineer and Architect*

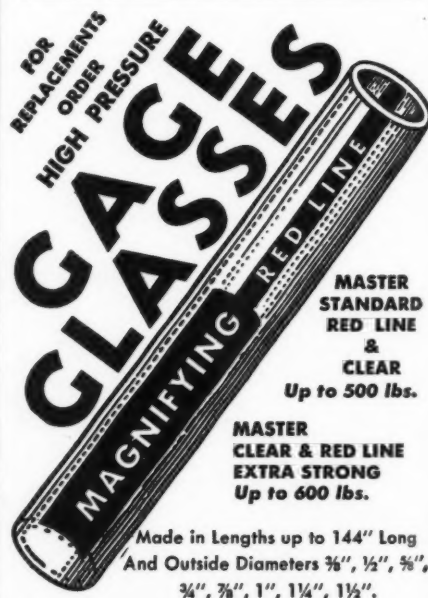
This book is intended as the basis for a review course and as refresher material for the thermodynamics part of the professional engineer license examinations. The contents cover a short outline of basic chemistry and physics which is of inestimable value and an elementary prerequisite for a proper understanding of the subject. Some problems are intermingled with the short outline to elucidate particular points. Both a short and a comprehensive table of contents covering thermodynamics and heat are also included. The author has given considerable thought to detailing the index so that the scope of material on each subject is apparent.

The problems, mainly from prior examinations for the professional engineer license, are explained and illustrated in sufficiently clear detail for an understanding of the particular topic. The addition of more basic theory would put the presentation in the realm of a textbook. That the author has presented more than a compilation of solutions to the problems takes this book out of the class of ordinary refresher publications.

It must be emphasized that a mere knowledge of the solutions to selected problems does not constitute a knowledge of the subject. A previously given problem may be rewritten so that it is not quickly recognizable as one in a refresher book. Basic theory must be thoroughly understood. The author has presented detailed basic theory, which if properly studied and augmented by reference to standard texts, should give a license candidate the proper back-

ground and preparation for the examination.

The topics are presented in an orderly and effective manner, and the cuts are clear. The inclusion of the tables on colored paper for ready reference, as used in public works specifications, is an original idea for a refresher book. The practice



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FIG. 21—Lip Mold



FIG. 22—Standard

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problem questions with answers at the end of the book, as in good texts, materially add to the value of the publication.

The book is recommended for the library of consulting engineers and architects as a reference for the young and old-time practitioners. It is also of interest and of practical value for students and practitioners in the related fields of architectural, mechanical, chemical, heating, ventilating, and air conditioning engineering, as suggested by the author.

ALSO AVAILABLE

REYNOLDS ARCHITECTURAL ALUMINUM PORTFOLIO and ALUMINUM BRIDGE RAILINGS . . . 1955 will be sent free of charge upon request on company letterhead, to Reynolds Metals Co., 2500 So. Third St., Louisville, Ky.

The architectural portfolio, 99 pp., covers applications of aluminum in architectural work and is made up primarily of availability information, presenting sizes, weights, alloys, and tempers of items carried by Reynolds in warehouse stocks or available without a die charge. The bridge railings manual, 55 pages, presents information on use of aluminum in railings and associated accessories.

DESIGN OF BLAST RESISTANT CONSTRUCTION FOR ATOMIC EXPLOSIONS, by C. S. Whitney, B. G. Anderson, and E. Cohn; the American Concrete Institute; 96 pp; \$1.00.

This is a reprint of a paper that appeared in the March, 1955 *ACI Journal*, based on the research program that began in the ruins of Hiroshima and Nagasaki. Part of this program was to determine by theoretical analyses and physical tests how particular structures would behave under blast loads. It presents methods and principles used in designing the first full scale blast resistant structures tested at Eniwetok, with results of those tests, and gives detailed procedures for computing blast loading, for designing individual structural elements and single multistory buildings, for computing ultimate strength of structural elements and frames under rapid loading, and for dealing with some special problems.

SYMPOSIUM ON METHODS OF TESTING BUILDING CONSTRUCTIONS, STP No. 166, American Society for Testing Materials; 136 pp, paper cover; \$2.75.

Seven papers on testing, evaluation, and performance of building construction, each paper authored by an authority in the field, are presented in this Symposium. The papers were originally presented at the 57th Annual Meeting of ASTM at Chicago, June 1954. ▲ ▲

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